See Back Cover!

SCIENCE AND INDUSTRY

POPULAR AVIATION

The New Bellanca Bomber

See Page 361

DECEMBER 25c
In Canada 30c

HERMAN R. Bollin

1934

AROUND THE WORLD..

Parks Graduates are making Aviation History

Across the broad expanses of China with her teeming millions—

Over the mountains and valleys of Siam, from the rain-drenched plains on the Bay of Bengal to the remote highlands famed for sapphires and emeralds—

Throughout the length and breadth of rugged Alaska, from Anchorage in the South to fire-ravaged Nome in the North—

High above the hurricane-lashed waters of the Caribbean—

Up and down the limitless coastlines of South America—

Over the mighty, snow-bound "hump" of the Andes on the difficult route from Buenos Aires to Santiago—

And in every part of the United States, the graduates of Parks Air College are carrying on the Conquest of the Air started by the resourceful Orville and Wilbur Wright just 31 years ago.

As the Wrights prepared with painstaking care for that first epoch-making flight of 12 seconds over the sand hills of Kitty Hawk, so these graduates of Parks have prepared themselves, by thorough training, to conquer the elements in every climate and to make the airplane the dependable and marvelously efficient servant of men everywhere.

All the resources of Parks Air College are devoted exclusively to aeronautical education and training. With its own airport of 100 acres—with extensive buildings and elaborate flight, shop, and laboratory equipment—with a personnel of 41 and a background of over five million miles of flight training, and the rebuilding and servicing of 1,385 airplanes and 367 motors, Parks Air College is especially well qualified to provide you with aviation training which leads directly to success.

Parks offers you three 2-year courses leading to BACHELOR-OF-SCIENCE degrees in

- **AVIATION ADMINISTRATION**
- **AERONAUTICAL ENGINEERING**
- **AVIATION MECHANICS**

The heavy fall enrollments have made necessary the building of a large, new dormitory. Even so it may not be possible to admit all students who want to come between now and the beginning of the winter term on January 7th.

If you, too, want to make aviation history at home or in the far places of the world; if you want to become an important part of the great aviation industry, you will want to know all about the opportunities offered you by Parks Air College. Mail the coupon, and the descriptive catalog—"Skyward Ho!"—and the Outline of Courses will be sent you immediately. You should act promptly to assure yourself of accommodations when you are ready to come, so

MAIL THE COUPON NOW . .

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WORLD'S LARGEST COMMERCIAL AVIATION SCHOOL

Approved by U. S. Dept. of Commerce **SECTION 12-PA, EAST ST. LOUIS, ILL.**

"SKYWARD HO!"

Our 44-page catalogue, completely describing Parks Air College and Parks training, will be sent free on request.

Name _____ *Age* _____

Address _____

City _____ *State* _____

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- ☐ Executive Transport Pilots'
- ☐ A. & E. Master Mechanics'
- ☐ Aeronautical Engineering
- ☐ Limited Commercial Pilots'
- ☐ A. & E. Mechanics'

NEW LOCKHEED P23 ARMY PURSUIT

Combination Land and Seaplane Set with Floats

32" Span. Length 22½". Weight 3½ oz.

One of the most outstanding values in models; it has excellent lifting power, rising from land or water in a few feet. From the latest army land plane it is convertible into Lindbergh's seaplane by attaching the floats, material for which is in the set. Construction set contains: formers, ribs and pontoon parts printed on balsa, turned cowl, front, celluloid wheels, axles, colored insignias, U. S. Army lettering, semi-scale propeller, yellow and drab dope, glue, 33"x44" full scale drawing, etc. Construction Set Complete, postpaid **$2.75**

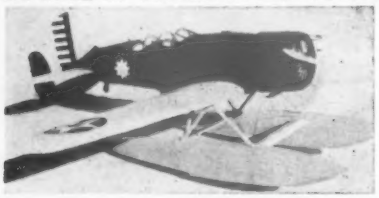
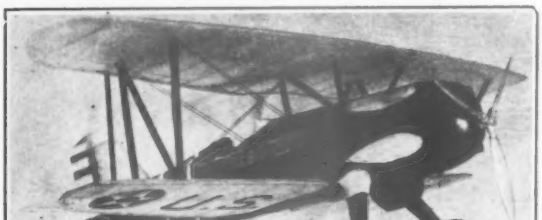


Illustration at left shows above model with floats on 2-in-1 combination set. Postpaid ... **$2.75**

CURTISS ARMY HAWK P6E PURSUIT



24" Span. Weight 2½ oz. Flies 800 Feet.

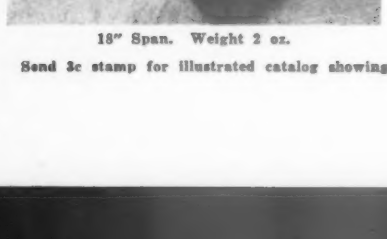
This new improved model of the P6E is the strongest and most perfect to be had; it is practically crash proof. Set includes: ribs, fuselage formers, radiator, wing tips, wheelpants, printed on balsa. Strong aluminum wheels, tail wheel, hollow metal exhaust pipes, wing, rudder, fuselage and U. S. Army insignias, printed instrument board, turned nose plug, formed prop shaft and motor hook, semi-scale fibre propeller, yellow and drab dope, glue, detail drawing with squadron design for fuselage and wheelpants. Set comes in colored labeled gift box sealed. Construction Set Complete, postpaid **$2.50**

NEW NORTHROP FTI NAVY FIGHTER

A new sleek fighter colored all silver. Set contains all parts printed on balsa, turned balsa cowl front, semi-scale fibre prop, silver dope, glue, Navy lettering, etc. Alum. wheels. Const. Set, postpaid.... **$2.00**

22" Span. Weight 2 oz. Color Silver.

NEW LAIRD SUPER-RACER



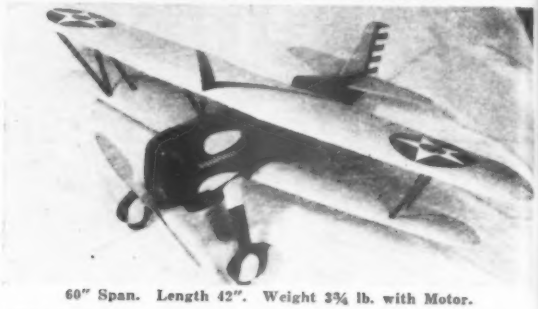
A beautiful, exact scale model. Color green and yellow, all parts printed on balsa, turned cowl front, strong aluminum wheels, colored dope, glue, fibre prop, drawing, etc. Construction Set, postpaid..... **$2.00**

18" Span. Weight 2 oz.

Send 3c stamp for illustrated catalog showing other models, etc.

5 FT. CURTISS ARMY HAWK P6E

1 Cylinder Gasoline Motor Driven Model

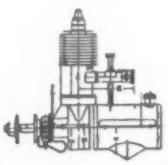


60" Span. Length 42". Weight 3¾ lb. with Motor.

This new 5-foot flying scale model is specially designed to fly with gas mo shown below. It is compact and very strong. Since all parts are cut to exact si this model is very easy to build.

Construction set includes fuselage formers, wing ribs, pants, all struts, etc., cut exact size and notched for stringers, spars, etc., 3" rubber tired wheels, tail wheel, silk covering material, yellow and drab dope, banana oil, glue, axles, beautif metal exhaust pipes, brace wires, drawing, 15" carved propeller. A thrill awa you in building this beautiful model, the only one of its kind on the market. Construction Set, postpaid, without motor **$25.0**

Model, ready to fly, with motor ..... **$150.**



1-5 H. P. GASOLINE MOTOR

⅞" bore, 1" stroke, used in above model. Mo comes complete with gas tank, coil, condenser, spa plug, 2 midget batteries, wiring. Price, ready to run, complete..... **$22.5**

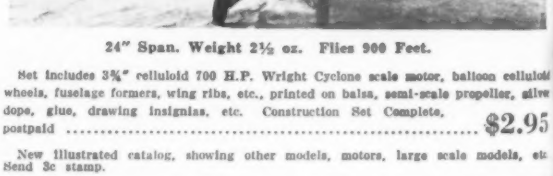
Specially designed unbreakable laminated propell for this motor, 15" ..... **$2.**
19" ..... **$3.**

BOEING F4 B4 NAVY PURSUIT

22½" Span. Weight 2½ oz. Flies 750 Feet.

A special detailed model of Boeing's latest pursuit. Construction Set includes fus lage, formers, ribs printed on balsa, wing, fuselage and Navy insignia, printed instr ment board, celluloid wheels with silver discs, silver and yellow dope, glue, drawin 3" celluloid motor, aluminum motor plate and drag ring, tail wheel, flyi wires, ready formed wire parts. This model is not only an excellent flyer but beautiful show piece. Construction Set comes in colored label gift box. Postpaid **$2.9**

CURTISS CYCLONE SEA HAWK P3A



24" Span. Weight 2½ oz. Flies 900 Feet.

Set includes 3¾" celluloid 700 H.P. Wright Cyclone scale motor, balloon celluloid wheels, fuselage formers, wing ribs, etc., printed on balsa, semi-scale propeller, silve dope, glue, drawing insignias, etc. Construction Set Complete, postpaid **$2.95**

New illustrated catalog, showing other models, motors, large scale models, et Send 3c stamp.

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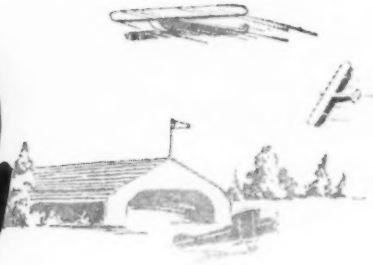
83 Low Terrace **New Brighton, N. Y.**

Prepare Quickly at Home in Spare Time

FOR A Good Pay Job IN THE Fast-Growing AVIATION INDUSTRY



WALTER HINTON: trail blazer, pioneer, explorer, author, instructor, AVIATOR. The first man to pilot a plane across the Atlantic, the famous NC-4, and the first to fly from North to South America. The man who was a crack flying instructor for the Navy during the War: who today is training far-sighted men for Aviation. Hinton is ready to train you at home in your spare time. Get his book. Listen to what he has to say. He brings you real opportunity to get into Aviation and cash in on its big future.

My famous course trains you right in your own home—gets you ready for one of the good ground jobs —or cuts many weeks and many dollars from flight instructions. Send for my big free book today.

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Yes, sir. Through the amazingly simple method I have worked out, I can train you at home to fill many well-paid jobs in Aviation. Naturally, before you can fly, you have to take additional instruction in a plane. Even on that instruction I save you time and money. But when you graduate from my course you have the necessary foundation to take up such work as Airport Manager, Metal Worker, Assembler, Wing Doper, Transport Worker, Welder, Instrument Maker, Inspector, Wood Worker, Airport Worker, Mechanic, and scores of other well-paid positions. Many of my graduates quickly get into jobs paying $40, $60 to $75 a week. Others, with the additional low-cost flying instruction I arrange for, become pilots at $300 a month or better. Send for my free book now and get the interesting particulars. Learn how I fit you to fill a good job immediately upon graduation.

You Have Many Types of Jobs to Choose From

This simple, fascinating, easy-to-learn course actually covers the ground so thoroughly, my graduates now fill many types of Aviation jobs. At good salaries, too. Read the list of jobs in the center of this page. Check them over carefully. Then remember that they are but a few of the many jobs that Aviation offers the trained man.

Aviation is Growing Fast

Get into Aviation now—when you are still getting in on the ground floor of a new industry—when you have a chance to forge ahead without having to displace lots of older men. Aviation is a young man's industry, where young men earn real money. The President of the biggest airline in the World is only 35 years old. Most famous pilots are in their early thirties, or even younger. It is a young man's industry, which means that there are plenty of opportunities to forge ahead. But just because it is run by young men, don't get the idea that Aviation is a small business. Millions are being spent yearly to develop and improve airways and planes. Thousands of men earn good livings from the business. And many, many thousands will enter it in the future. It is a great and growing industry, this Aviation, an industry that still brings romance, excitement, thrills—even while it is bringing big opportunities and good pay.

Here are just a few of the many well-paid jobs in the fast-growing Aviation Industry

ON THE GROUND

Airport Superintendent	Purchasing Agent
Instrument Specialist	Aerial Mail Clerk
Electrician	Motor Expert
Shop Foreman	Radio Operator
Hangar Crew Chief	Airplane Mechanic
Traffic Manager	Field Work

IN THE AIR

Air Express Agent	Private Piloting
Air Mail Pilot	Weather Observer
Aerial Photography	Flight Instructor
Airport Manager	Commercial Pilot
Test Pilot	Field Manager
Aerial Passenger Agent	Transport Pilot

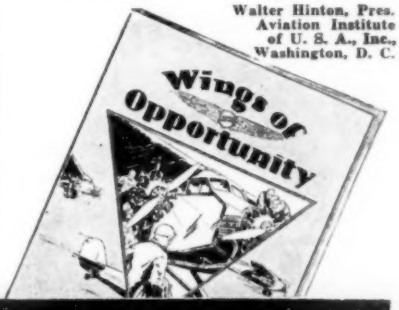
I Have Helped Secure Jobs for Many of My Graduates

Due to my wide spread connections with aviators, plane manufacturers, airport managers, etc., I am in an especially favorable position to locate jobs for trained men. My Aviation friends know that Hinton-trained men are well qualified to fill any job for which I recommend them.

Send For My Free Book Now

Now is the time to act. Don't sit content with a humdrum job with no future. Act now—to get yourself into Aviation—the industry that is slated to grow into a giant business in the next few years. Get into Aviation. Study at home in your spare time for a well-paid job with a real future. Mail the coupon for my free book today.

Walter Hinton, Pres.
Aviation Institute
of U. S. A., Inc.,
Washington, D. C.



FREE FLIGHT

"Give her the gun!" You're off! Yes siree, as soon as you complete my course, I arrange a free flight for you at an accredited air field. It doesn't cost you a penny. It is my graduation present to you.

Mail for my big FREE BOOK on AVIATION Now!

Mr. Walter Hinton, President 836-Z
Aviation Institute of U. S. A., Inc.
1115 Connecticut Avenue, Washington, D. C.

Please send me a Free copy of your book, "Wings of Opportunity," telling all about my opportunities in Aviation and how you will train me at home for them.

Name.....
(Print clearly)

Address..... Age.....

City..... State.....

These Men Made Good With My Training

Got Good Job at Airport

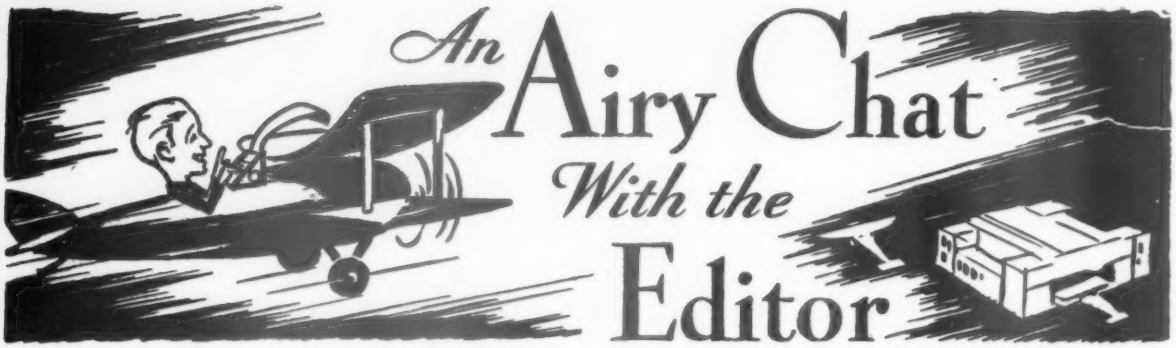
"I am now working at the Ashville Airport. My work consists of selling tickets and servicing ships before flight. Mr. Bender, who owns the airport, called at my home after receiving your letter. Thanks very much for writing Mr. Bender." —Nick Molnar, Patton, Pa.

$75 a Week as Instructor

Robt. N. Dobbins, a Hinton graduate, writes: "I cannot thank you enough for the assistance you gave me in getting my present position. Last week they promoted me to Chief Instructor, at a big salary increase."

Training Gives Quick Results

"I received a call from the manager of a nearby airplane factory, who understood I was taking your Course, and asked if I would accept a position as chief mechanic and, in his absence, act as manager." —Edward F. Dick, 2202 Tuscarawas St., West Canton, Ohio.



An Airy Chat With the Editor

TALK about getting coverage with a simple little notice! Well, you should have seen the stream of replies coming in after I ran that little note in the Kontact Klub Kolumn requesting information concerning the Gates Flying Circus. This quick response is indicative of the great interest taken in P.A. and the fine spirit of cooperation that has always existed between the readers and our editorial department.

The issue was hardly on the newsstands when we received the following fine letter from Don P. Grafflin, Greenwich, Conn., a former member of the Gates Flying Circus. We thank him for his courtesy.

One of the boys informed me that you wish to obtain information regarding the Gates Flying Circus. It was my privilege to work with the circus for about six months. The group is entirely broken up now, I believe.

However, Mr. Clyde E. Pangborn was head of the outfit and can give you all the facts concerning it. I believe he is now preparing for the Australian flight with Roscoe Turner. I regret that I do not know his address.

If you cannot get in touch with Mr. Pangborn, I suggest that you try to get information regarding William C. Brooks—who was second in command of the circus.

And right after we received the above letter, along came the second big surprise—a letter from William C. Brooks himself! This letter was certainly appreciated for it came straight from headquarters.

I saw the advertisement in the Kontact Klub Kolumn requesting information on the Gates Flying Circus. As you probably know, I was second in command of the circus in the beginning and finally in command at the last. I still have some of the old account books of the circus in my possession.

I will be very glad to provide you with any information that you desire.

And then, came a letter and a very comprehensive one from a mechanic, Bill Rhode, who was also with the circus. This letter is reproduced in this issue, word for word. All in all, it looks as if we were all set for an authentic and highly thrilling history of the Gates Flying Circus—the most famous air-circus of all time. And could they fly!

JUST HERE we wish to make an announcement of unusual interest to our student readers. Mr. J. D. Van Vliet, an aeronautical engineer of long experience, has kindly consented to write a thumb-nail series of articles on the airplane propeller, its theory and design. Simplified articles on the propeller have been few and far between and we feel sure that you will enjoy this series.

* * *

GENERAL WILLIAM MITCHELL is at the bat again with new and original ideas on a flotilla of airships.

Cartoonist Poinier graphically illustrates the effect of racing and stunting upon the general public. Why continue the carnage?

The good General can always be depended upon for creating a sensation, and this time he has certainly created a furore in Washington. More power to him.

* * *

YOU CAN'T keep a squirrel on the ground any more than you can keep an aeronautic enthusiast on the ground (except by the act of the Bureau of Air Commerce).

We have with us this time, the well-known publisher, Bernaar Macfadden, who decided to take up flying at the age of 63 years and who has over 500 air-hours to his credit. He is now 66 years of age and is still going strong. In addition to, and probably secondary to his flying activities, Mr. Macfadden publishes several metropolitan newspapers and nearly a dozen magazines.

* * *

OUT OF 100 power-giving heat units in the gasoline, from 70 to 75 of these heat units play hookey from their job and wander about aimlessly—heating the landscape. The 25 to 30 conscientious heat units that remain with the aviation engine are the ones that whirl the propeller.

Now it would seem, after all these years of experiment, leading literally to thousands of patents on gasoline engines, that this performance could be materially improved. The Diesel engine is certainly not the answer. The binary vapor engine has not proved itself and we are still about where we were during wartime so far as efficiency is concerned. Where is the genius that will put 80 or 90 of these wandering heat units to work?

* * *

WE HATE to say good-by to the old high-wing tri-motor Ford transports which did such valiant service during the past few years. If they were not speedy, they certainly were reliable and safe and did their bit in making commercial aviation what it is today. Mebbe, when the present low-wing mania subsides, we will get back to the Ford idea of safety.

* * *

DO WE need more powerful transmitters on our radio airway beacons? That's the question? We have heard numerous reports of the signals being blanketed by static during the past summer to the great annoyance of the pilots. Come on, you radio engineers, and kill that static.

* * *

THE EDITORIAL writer in the "Air Line Pilot," official organ of The Air Line Pilots' Association, voices our opinions precisely in the September issue of that excellent paper, under the heading of "Swivel-Chair Pilots." And this is what he says:

Swivel-chair pilots still seem to have aviation "well in hand" and, unless stopped, will rubber-stamp the industry to an untimely end.

These same death-defying desk flyers talk LOUD and LONG concerning

(Concluded on page 390)

XUM

POPULAR AVIATION

Including SOUTHERN AVIATION and AERONAUTICS

A MAGAZINE FOR THE PROMOTION OF AMATEUR AVIATION AND PRIVATE FLYING

Volume XV | DECEMBER, 1934 | NUMBER 6

NRA CODE

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The Traffic Department of

by

E. STANTON BROWN

Commercial Air Transport Editor of
POPULAR AVIATION

The spacious interior of a Pan-American "Clipper-ship" is about 18 inches wider than a Pullman car.

"WHEN is the next plane to New York?" hurriedly inquired a voice at the other end of the wire in Chicago.

"The sleeper plane at 11:05 p. m., sir, arriving in New York at 6:00 a. m."

"What's the fare?"

"Forty-seven ninety five one way—$86.31 round trip—with an extra charge of $3.75 each way for the sleeper."

"Is there a plane back tomorrow night?"

"Yes, sir, leaving New York 12:35 a. m., arriving Chicago 6:00 a. m."

"Good! Make my reservation, round trip, leaving tonight and returning tomorrow night," the voice snapped.

That night reservation clerk consulted his space assignment chart. It told him that all space out of Chicago through to New York was sold and that he had space only as far as Buffalo.

"I'll have to wire for space, sir," he informed the passenger. "May I have your name and phone number?"

"Name's Johnson. I'm in room 1426, Stevens Hotel."

"Thank you, sir. I'll call you in half an hour."

In airways code, the messages were jotted down on radiogram blanks, one to Buffalo and one to New York and were phoned to the Operations Department at the field. The company radio snapped out through the night air. To Buffalo: NEED JOHNSON ABVNK LEAVING CHICAGO HAUBA. To New York: NEED JOHNSON ANKCG GAUBC.

The first message, translated, said that one seat was needed from Buffalo to New York for Mr. Johnson who was leaving Chicago on Trip 8 on August 21st. The second message requested one seat for Mr. Johnson from New York to Chicago on Trip 7 of August 23rd.

Before the half hour had passed, the answers were received by the Traffic Department: SELL JOHNSON ABVNK LEAVING CHICAGO HAUBA—SELL JOHNSON ANKCG GAUBC. Forty-five minutes later, Mr. Johnson was picked up at his hotel and whisked by car to the airport to board his plane in which he would sleep comfortably in a roomy berth through the night to awaken in New York the next morning.

Such is part of the routine of an air traffic office, a constant ebb and flow of a thousand types of individuals on their way to points throughout the United States, Canada, Mexico, Central and South America, over the greatest network of airways in the world. Fascinating business! Though bound in routine it is made always interesting by contact with the varied types of passengers, some dull and stupid, some witty, some famous, and a traffic man's thoughts often wing with one taking a particularly interesting trip. Fascinating because of the thousand and one problems which present themselves to be solved by keen minds.

The making of a reservation is not always as easy as the example quoted above, however. Sometimes the space is sold out all the way through and you have an irritated passenger on your hands to pacify. There are several kinds of pests among the people who travel the airline consistently and they soon become known throughout the traffic offices.

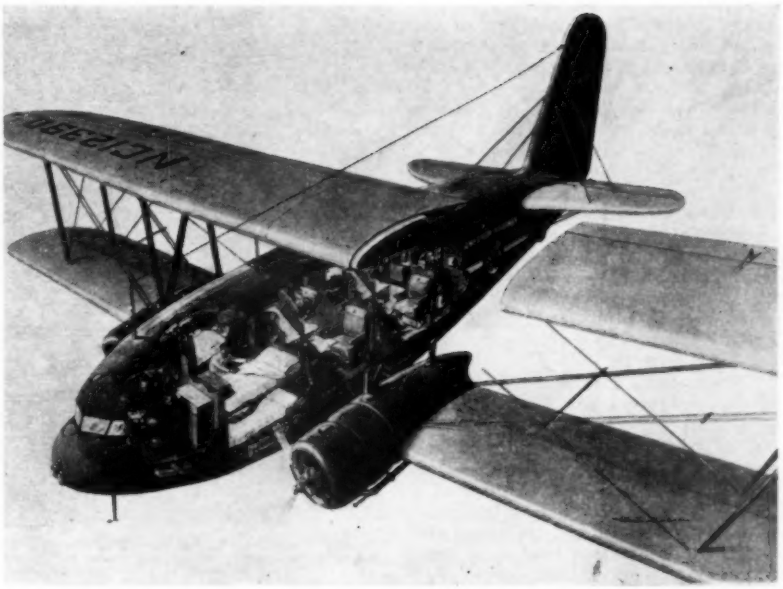
There are those who always call at the last minute for a reservation and act as though they had been rendered a personal insult when the space is not

Built for extremely high speeds over moderate distances, the interior of this Lockheed "Electra," Northwest Airways, is relatively compact.

A Commercial Airline

THIS is the first of a series of articles by Mr. Brown on the subject of commercial airline operation and maintenance. It treats of the sales department and advertising methods pursued.

In the succeeding articles will be complete descriptions of the various departments of well organized airlines, such as the mechanical departments, radio division, etc.



A Condor Sleeper plane operating on the American Air Lines. Note the opened berths and interior arrangement of this modern "Pullman of the Air."

available. Again, there are those whose pet indoor sport is making and cancelling reservations.

One evening, a man phoned for a reservation to New York two hours before the plane left. Through space out of Chicago was sold out and it was therefore necessary to radio for space from Detroit to New York. Before the answer was received, he had cancelled the seat.

Another radio was dispatched cancelling the requested space. It was no sooner on its way than the same man called and wanted *two* seats to New York. Once more radiograms split the night. The space was finally secured for him. He said he would go direct to the field. Ten minutes before the plane took-off he phoned in and cancelled both seats.

In the meantime, another person had called in for a seat to New York and could not be given it. The plane went out with two empty seats and the company lost money. It was learned later that the first man took a train to New York the next day.

Sometimes there is a good excuse for such events, but the majority of cases are due to people who are irresponsible or careless. Nevertheless, they must all be treated with courtesy and tact. The type of man above, who, in all probability had a just cause for his erratic actions because of some unusual business circumstances, is easier to put up with than those whose names finally end up on the "no-show" list. They are the people who make reservations, are in a great hurry and say they will pick up their tickets at the field. Then they fail to call in and cancel their seats and never show up at the field.

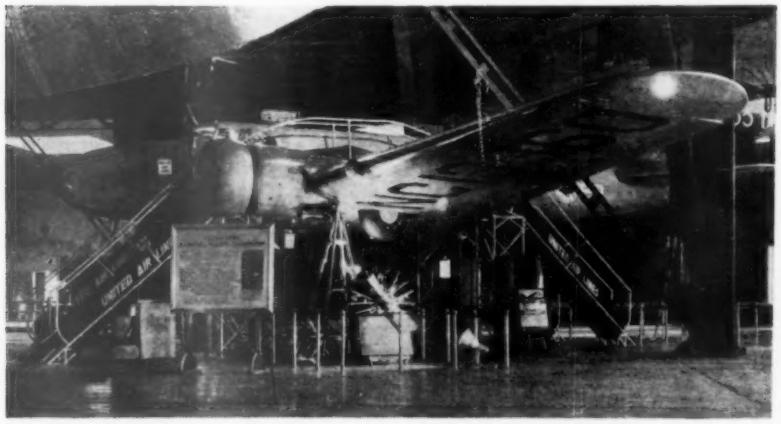
When this has happened several times, the person's name is placed on a "no-show" list. He becomes known in all the traffic offices and reservations will not be made for him until his ticket is paid for. Then, if he fails to show at the field, it takes several weeks and a letter of explanation from him before the money is refunded. Fortunately, such people form a very small percentage of those who fly.

The routine of handling passengers, supplying them with tickets, dispatching express, answering questions, working up itineraries, fascinating in itself, is but a part of the efficient methods which go toward keeping an airline in the air. Behind the routine, in the Traffic and Publicity Departments, lies a still more important part of the great work—getting people into the air who are still groundlings.

Last year, 568,940 passages were sold on American airlines. While this number shows a steady increase in air passenger traffic, it is but a minute percentage of the number of people who travel and could use the airlines to advantage. It is the constant struggle to increase passenger and express revenue, the eternal battle against prejudice, ignorance and travel habits of long standing, which adds the final touch of spice and zest to the adventure of air transportation.

The men in the Traffic Department of an airline, whose business it is to educate the traveling public, must be keenly alert. Their knowledge of air transportation, in all its phases, must be broad. Their personalities must be such as to enable them to create and maintain favorable impressions and build up faith and confidence in the minds of their prospective passengers.

Education, not only in his particular line of endeavor, but a liberal education combined with correct social habits, goes far toward determining whether or not a traffic man is an asset to air transportation. He is required to meet and converse intelligently with business men and professional men of high standing, and must be versatile enough to adapt himself to all circumstances. A knowledge of psychology and a sixth



A Boeing "247" exhibited at the Century of Progress, Chicago. This is one phase of publicity methods.

sense which indicates the correct time and line of approach to a prospective air traveler are a traffic man's invaluable tools.

Where other means have failed, or only half succeeded, a sudden turn of events, and the swift grasping of the opportunity offered, has a thousand times delivered a new convert into the air.

There was one instance in which a man just could not see the sense of air travel. He had been up once with a joy-ride pilot in an antiquated plane and had ended up in a corn field with the plane on its nose. There were too many risks. Anyway, why did a man have to be in such a hurry? He agreed that all that could be said for air travel was probably true, that there was no comparison between the ship he had been up in and modern airliners, but he was not interested.

The case was obviously one of fear. The only way to cure him of it was to get him up in modern equipment and show him at first hand what air transportation of today has to offer. He reluctantly accepted the offer of a "courtesy flight" about the city in one of the newest and finest transport airplanes today. It is a long step, however, from a man's acceptance of a flight and the moment when he is comfortably seated in a spacious cabin several thousand feet in the air and wondering just what in Heaven's name he had been afraid of. More than one has failed to show up for the flight or else become too busy to get away from the office for it.

Suddenly, it was learned that the man's wife had been teasing him to let her fly to New York. There are few men with whom wives do not usually get their way. It so happened that the new ship in which he had been offered a "courtesy flight" was to make its initial flight to New York at just the time his wife wanted to go. All the details and excellent qualities of the ship were brought to his attention, once more the workings of an airways system was explained. It was suggested that his wife fly on the first flight. He became more interested. He asked questions. At last he thought he would let her fly one way.

It was then brought to his attention that there was a ten percent reduction on a round-trip ticket and if she liked the journey she would undoubtedly want to fly back. If not, the difference between the one-way fare and the round-trip fare would be refunded. He bought a round-trip ticket.

When his wife arrived in New York, she sent him a telegram: "I WILL NEVER TRAVEL ANY OTHER WAY AGAIN STOP RETURNING BY AIR." The telegram was followed by a long letter describing the flight. Today, the man flies whenever he travels and enjoys it thoroughly.

Such cases are unusual, of course, but in this new and unusual business of air transportation one must be ready for anything. In some instances, a man can be appealed to through his sense of humor. It takes an accurate appraisal of his temperament, however, before such a course should be tried.

Playing a game of bridge in one of the compartments of a "Clipper-Ship" operated by the Pan-American Airways. These very large flying-boats afford plenty of room for comfort on the long trips traversed by this line.

There was one man who stoutly affirmed that he had never flown and never would fly. A jocular letter was written to him in which it was pointed out to him that he had a not uncommon disease known as "groundophobia," and offering a courtesy flight as the cure. The number of people who fly and several other things were brought to his attention in a humorous but tactful manner. He was amused and not a little flattered at so much attention being paid him. He took the courtesy flight. He flies.

The "courtesy flight" is used mostly in extreme cases. The advent of a new ship on a line, however, is the signal for a good many such flights to exhibit the new equipment to those who fly regularly as well as those who have to be sold on air transportation.

In air travel solicitation, however, a man's intelligence and common sense are first appealed to. The facts of air transportation are put squarely before him, and he is shown how he might use the airlines to his advantage. His questions are carefully answered. If, in addition, the air traffic man has favorably impressed him, shown that he knows what he is talking about and has won the prospective air traveler's confidence, the battle is more than half won.

In the business of educating people into the air, the Publicity Department works closely with the Traffic Department. The publicity men, however, contact the public in a different manner. They rarely see those to whom they have pointed the way into the skies. Advertising, news releases, photographs —these are the media through which publicity men reach their public.

"Keep air transportation always before the eyes of the public." Such is the watchword of the Publicity Department. New equipment, new records, increases in the number of passengers carried, increases in frequency of service, the growing total of the number of miles flown, famous people using the airlines, long periods of service of pilots, safety, and hundreds of other items are compiled into frequent news releases and sent to newspapers.

Wherever possible, photographs are used. One good photograph can tell more than ten thousand words. Pictures of comfortable cabin interiors filled with passengers nonchalantly eating lunch at ten thousand feet, of planes with huge piles of express being loaded into them, of well-known people arriving or departing by air, of sturdy wing and fuselage structures, of swift new planes, of beautiful airscapes along the route. People always look at pictures and the entire story is told at a glance.

One of the best forms of advertising the airlines have costs them nothing. It is known as "word-of-mouth" advertising. People who have traveled by air tell their friends about it. Almost everyone who flies is enthusiastic about it. The word spreads. But at the same time there must be intelligent advertising in the types of magazines read by those who go by air, or should go by air, and in newspapers.

This advertising is directed toward two ends. Part of it must bring immediate sales and part of it is educational, known as "long pull" advertising. The first type is seen in newspapers and magazines in the form of

(Concluded on page 405)

XUM

The Biography of Glenn Curtiss

by ROBERT H. RANKIN

Glenn H. Curtiss is the outstanding American pioneer in aviation. He not only originated many types of airplanes still in service but he left a lasting imprint on aviation in general through the manufacturing plants bearing his name.

THE name and genius of Glenn H. Curtiss is known to everyone who has ever had contact with aeronautics. He founded one of the greatest airplane and motor manufacturing companies in the world and his contributions to the science of aerial navigation are legion. He is second only to the Wright brothers.

Curtiss was born at Hammondsport, N. Y., May 21, 1878. As a youth he evidenced great interest in mechanical vehicles and after completing his high school education, he engaged in a series of experiments with motorcycles. In 1907, riding a motorcycle of his own design and construction, he attracted wide attention by establishing a speed record of 137 miles an hour. As a result of his experiments, Curtiss developed a motorcycle engine which became famous for its reliability and efficiency.

The Curtiss motor was then found to be fitted for aeronautical service and in 1904, Curtiss made his first contact with aviation when Major Thomas S. Baldwin came to him with an order for a motor for his airship—the *California Arrow*. This airship was an outstanding success at the St. Louis World's Fair in 1904 and Baldwin gave credit for the success to the motor.

As a result, it was not long until all dirigible balloons in this country were using Curtiss motors, and the first contract ever awarded for a navigable balloon by the United States Government was given to Baldwin. This balloon, the Signal Corps Dirigible No. 1, was built at Hammondsport and was powered with a water-cooled Curtiss engine. During the summer of 1905, the dirigible made a successful two-hour flight at Fort Myer, Virginia, with Baldwin acting as pilot and Curtiss as engineer.

An old "Jenny," technically known as the Curtiss JN-4h, one of the best known of all Curtiss airplanes.

During this time, Dr. Alexander Graham Bell, inventor of the telephone, had taken an active interest in flight and in 1905 he requested Curtiss to build a motor for a tetrahedral kite with which he was experimenting. It was not until the summer of 1907, however, that Curtiss was able to visit Dr. Bell at Baddeck, Nova Scotia, his summer home.

While there, he met F. W. Baldwin, J. A. D. McCurdy, and Lieut. Tom Selfridge, all interested in practical aviation and when Mrs. Bell agreed to finance the work, the group formed the Aerial Experiment Association, with Curtiss as director of experiments. During the fall of 1907, the work of the association was moved to Hammondsport, and after some weeks spent on glider experiments, it was decided to build power machines.

The third machine constructed, the *June Bug*, on July 4, 1908, won the *Scientific American Trophy*. This trophy, the first offered in this country for airplane flights, was awarded for the first public officially-observed, previously announced flight over a distance of at least one kilometer.

Early in 1909, the Aerial Experiment Association was dissolved and Curtiss turned his attention to over-water flight. The *June Bug* was equipped with pontoons and attempts were made to fly it from the water. These attempts were unsuccessful and it was decided, in November of the same year, to give up the experiments for the time being.

As a result of the winning of the *Scientific American Trophy*, the Aeronautical Society of New York City placed an order in 1909 with Curtiss. The plane was completed in June and demonstrated at New York City. On July 17th, Curtiss flew the machine around a closed circuit, a distance of 24.7 miles, winning the *Scientific American Trophy* for the second time, and in addition, winning the Cortland Field Bishop prize.

Following this, Curtiss was chosen to represent the Aero Club of America at the first International Aviation Meet. This meet was held at Rheims, France, August 22-29, 1909, and was attended by Bleriot, Latham, and others equally as famous. Flying a new machine, powered with a Vee-type water-cooled engine, Curtiss won the first international speed trophy, the Gordon Bennett cup, winning from Bleriot by a margin of six seconds.

After this, Curtiss built numerous machines and engines as well as in-

Lieut. Russell H. Maughan and his Curtiss pursuit ship with which he made the famous "Dawn-to-Dusk" flight across the American continent.

structing Army, Navy, and foreign officers in the art of flying. He formed the Curtiss Exhibition Company, the country's first flying service. On May 31, 1910, he made a flight from Albany to New York, a distance of 150 miles, in 2 hours, 21 minutes. This flight won for Curtiss the $10,000 prize offered by the New York *World*, and the *Scientific American Trophy* for the third time.

Curtiss was among the few men who, in the earlier days of aviation, visualized the importance of airplanes in warfare. In 1910 he demonstrated the possibilities of bombing and sharpshooting from the air, and the reception of wireless messages from an airplane in flight. In the same year he started his first flying school at Hammondsport, and later he opened schools at San Diego, Cal., and Miami, Florida.

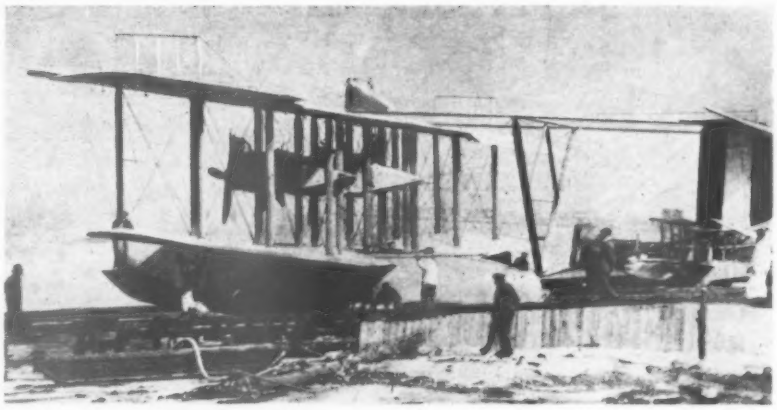
Having retained his interest in building an airplane which would fly from the water, Curtiss resumed his experiments along this line, and on January 26, 1911, he made a successful flight, using a plane mounted on a single pontoon. By attaching wheels to the pontoon, Curtiss converted his machine into the world's first amphibian, and on February 23rd of the same year he made a successful flight with it.

In the early hydro-airplane, thus developed, the motor and pilot were above in the usual position in the wings, while the pontoon or hydroplane was a considerable distance below the wings.

Thus, there was a good deal of head resistance. Curtiss set about reducing this head resistance by incorporating the pilot's seat with the pontoon, and the outcome was the flying-boat. Work on the flying-boat was completed rapidly and in July, 1912, it was successfully demonstrated at Lake Keuka, Hammondsport, N. Y.

For his work in perfecting the hydro-airplane and the flying-boat, Curtiss was awarded, through the Aero Club of America, the Collier Trophy for 1911 and 1912. This trophy is awarded annually for "the greatest achievement in aviation in America, the value of which has been thoroughly demonstrated during the preceding year." In 1913 he was awarded a medal by the Smithsonian Institute.

Glenn H. Curtiss as he appeared when flying one of the old Curtiss pushers.



The NC-1, a Curtiss naval flying-boat, a sister of the NC-4, the first airplane to cross the Atlantic Ocean. The NC-1 also flew on this trip but did not quite complete it.

During 1913, the "JN," forerunner of the famous "Jennies," was designed and built. This plane was pronounced by army officers to be the most perfect produced up to that time, and in little more than a year the "Jenny" was one of the most useful planes in the American training service.

Early in 1914, Curtiss designed and built the "America" for Rodman Wanamaker. The "America" was the first multi-motored flying-boat ever built, and it was the first heavier-than-air craft ever designed for trans-Atlantic flight. The plane was powered with two 90 h.p. motors, and weighed 2,600 pounds when fully loaded. The outbreak of the European War put an end to the enterprise of flying the Atlantic, the machine was sold to the British Government and was put into commission with a coast defense squadron.

Later, in the same year, the Curtiss company redesigned and reconstructed Langley's flying machine and Curtiss made a successful flight with it. Langley had approached the subject of aeronautics from a strictly scientific viewpoint, establishing testing apparatus and building successful self-propelled models.

His research in mechanical flight began in 1887 and continued up to 1903 when his successful flying model was reproduced to full scale. This machine was manned for its trial flight by a human pilot, but it was wrecked in launching and did not fly. Had the machine performed as successfully for Langley as it did for Curtiss, Langley would have antedated the Wright brothers by a narrow margin of about two months.

From 1914 to 1918, many types of planes were designed and built. Among these were the S-3, a triplane scout; the R-4, a reconnaissance biplane; the model K triplane scout; the F-5-L seaplane; the model F flying-boat; and a twin-motor military biplane.

During 1918, the Curtiss Company came under the control of the Willys-Overland Company with Curtiss remaining with the new company as a director. The newly designed Oriole landplanes and Seagull flying-boats were now produced by the company. Curtiss had visualized airplanes carrying mail, being used for travel, exploration, and transportation and when the war ended, he directed his energies along these channels.

The Curtiss Exhibition Company was reorganized as the Curtiss Flying Service to handle all phases of commercial activity, with the exception of the manufacture of planes and motors. While the commercial aviation field did not bear out the promise of the post-war period, the Curtiss Aeroplane & Motor Company continued to produce new models and to pioneer in various engineering developments.

In 1919, the Curtiss Eagle Airliner was developed and the famous NC boats were completed. These boats were the first tri-motor seaplanes ever constructed in this country, and one of them, the NC-4, was the first aircraft to ever cross the Atlantic. In this same year, Roland Rolfs flew a Curtiss pursuit ship to a world's altitude record of 32,450 feet.

During 1920 and 1921 Curtiss built the first of a series of racing planes for the Pulitzer and Schneider Cup races. These planes brought to the United States the world's records for both land and seaplanes.

From 1921 to 1930 the following planes were brought out:

1922 to *1923* The NBS-1 bomber, the TS-1 seaplane, and a Curtiss-Army pursuit plane powered with a 400 h. p. D-12 Curtiss engine.

1924 Development of the *Hawk*, a fighter powered with a D-12 engine, showing a top speed of 187 miles an hour. Development of the *Falcon* observation plane, the twin-engine *Condor* bomber, and the *Carrier Pigeon* mail plane.

(Concluded on page 405)

TWA Ford Trimotors Retired

Transcontinental and Western Air are now retiring the faithful old Ford Model 4AT transport planes that have given such faithful and efficient service over a long term of years. They are to be succeeded by the new Douglas low-wing monoplanes.

LIKE faithful old fire-horses, unshod and retired to a life of ease amid green pastures, a fleet of veteran trimotored airplanes is facing retirement after almost a decade of active service on the mid-transcontinental airway between New York and Los Angeles.

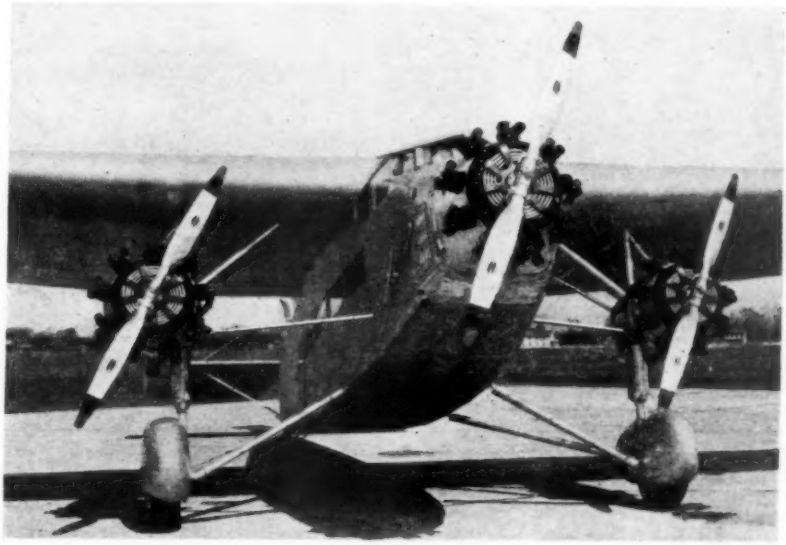
The airplanes are the all-metal Fords with which Transcontinental & Western Air inaugurated the first coast-to-coast passenger service in 1929. Some of the veteran planes saw active service before that date on Maddux Air Lines between Los Angeles and San Francisco. Their retirement has been foreshadowed for a year or more by the appearance of the TWA Douglas Airliner.

Thousands of travelers made their first flights in the sturdy old Fords; thousands of air-line mechanics have a real, almost personal affection for the "Tin Geese" as they have been called. Sturdy, dependable and with thousands of miles of flying still remaining in them, they have never, of themselves, caused a serious accident nor a fatality. Like so many man-made machines they have merely served their time and can no longer compete in matters of speed, comfort, passenger and cargo capacity or general all-round performance with the younger, but already severely-tested Douglas Airliner with which TWA is now operating its coast-to-coast service.

The retired airplanes can look back upon a career of service unsurpassed by any other modern vehicle. Although there were only about two hundred Ford trimotor planes manufactured, their total flying mileage reaches into the millions; the total number of passengers they have carried must be close to the million mark. They saw service on every major airway in the United States and in many foreign countries. The hum of their three radial motors was familiar to city and rural dweller throughout the world.

The Fords were, at times, adventurers as well as prosaic carriers of passengers, mail and express over the regularly established airways. They have explored the Polar regions and they have pioneered the aerial routes along the Equator and across the lofty Andes. Some, among them, have military records.

They were fast flying machines in the early days of commercial aviation in the United States. Today, their cruising speed of 120 miles an hour has been exceeded by about 50 percent by the larger and more comfortable Douglas. In its best days the Ford made the transcontinental crossing in slightly more than 24 hours. The Douglas today makes the same flight in less than 16 hours.



A front view of the all-metal Ford 4AT monoplane. This particular ship is equipped with experimental Packard-Diesel engines in place of the more common radial gasoline engines. A good, staunch old ship.

Their capacity of twelve passengers was considered ample in 1929, and the noise of their three engines made conversation in the cabins difficult, almost impossible. Today, the air-liners carry fourteen passengers at almost 200 miles an hour and the two powerful motors make so little noise that conversation is carried on in an ordinary tone of voice.

There was a total of 1,275 horsepower available in the three engines of the Ford—powerful pieces of aeronautic machinery in those days. Today, the Douglas has only two motors but the total horsepower is 1,420. The Douglas can fly, fully loaded, on only one of its motors. The Ford could fly on two of its motors. Under favorable conditions the Ford could climb to an altitude of about 16,000 feet; the Douglas, with its supercharged engines and its controllable pitch propellers, cruises normally at about 14,000 feet.

In the Ford, the pilot had a few mechanical and navigating instruments to inform him of the plane's performance. In the Douglas, the pilot has a vast array of perfected instruments, each of which tells a specific story.

The Ford landed at one predetermined speed. The Douglas pilot, by means of the "air brakes," controls the landing speed within specific limits and needs much less airport area to make his landing. The Ford had a cruising range of about 500 miles at the outside. The Douglas can fly 1,300 miles without refueling—a range sufficient to fly around any ordinary local storm area.

Although comfortable, according to the aeronautic standards of 1929, the Ford cabins were a bit cramped, particularly for tall passengers. The Douglas was designed for the comfort of the six-footer who can stand erect with his hat on and not touch the ceiling. Passenger chairs in the Ford were adjustable to three positions; Douglas chairs are adjustable to any comfortable position and are reversible. The Douglas cabin is, in the truest sense, air-conditioned.

Today, along the TWA airway, the Fords sit shorn of their motors looking forlorn and forgotten outside the hangars from which they have been removed to make room for the more modern Douglas. Many a mechanic has been seen to slap a rugged Ford fuselage as if in farewell. Some have eulogized the old veteran in poetry.

Many of the Fords, however, are still doing service on some of the short lines and branch lines about the country, but even on these airways, the call for speed and quietness is spelling the doom of the old 4AT. The development of the so-called "shuttle-plane," a small, high-speed plane specially designed for branch line service, is loosening the hold of the old Fords.

In view of the safety of these old high-wingers, and also in view of the many discrepancies of the modern low-wing type, it is interesting to speculate upon the future of the monoplane. Will we ever go back to the high-wing type?

Celebrate Historic Flight of the LaFrance

This is the historic airship, LaFrance, a non-rigid type that proved a success at an early date.

GREAT attention was paid to the birthday of the dirigible in France. The French people, because of the many early experiments made in their country, consider the dirigible as their own invention and creation.

During the ceremonies marking the fiftieth anniversary of the flight of the airship LaFrance at Chalais-Meuden Park, a modern airship cruised over the route followed by the pioneer LaFrance shown by the accompanying photograph. As will be seen, the general idea of streamline forms was fairly well understood even in that day and that the assembly as a whole does not greatly differ from that of a modern blimp.

This old airship may not be speedy but it contains most of the fundamental elements to be found in a modern airship. It is a remarkable demonstration of early inventive genius.

English Amateurs Show a Parasol Lightplane

FOR several years, the parasol type of lightplane has been the prevailing type in America and that it is also popular in England is proved by the accompanying photograph.

This English lightplane, however, has several very prominent features that are seldom encountered in America. For example, note the extremely low position of the landing wheels, the engine mounted on the leading edge of the wing and the elevated position of the tail group. At first glance, not many pilots on this side of the water would approve of the propeller position but probably this is a matter of personal taste.

However, taking performance as a criterion of comparison, the little English ship shows up wonderfully well. It is said, from the source of the picture, that the landing speed is less than 25 m.p.h., which is sure going some with a top speed of 90 m.p.h. The proof of the pudding is in the eating thereof.

An English lightplane of the popular parasol type in flight. Note the position of the engine.

Gross Builds a 3-place Glider

THE first three-place glider ever to be built in America, it is claimed, took to the air from Akron, Ohio, Municipal Airport in a score of successful trial hops. It was built by Dr. Frank Gross of Akron, designer of many record-breaking sailplanes. It was flown by Bill Bodenlos of Goodyear Zeppelin corporation, a veteran glider pilot.

The "Gross F 5," so named because it is the fifth distinct type of glider which Dr. Gross has designed, might really be called a four-place instead of a three-place glider, because two small-sized passengers besides the pilot and co-pilot may be easily carried in the rear seat.

"We can have back seat driving or call it a 'mother-in-law seat'," laughed Dr. Gross.

The fact that it has dual controls and side-by-side seats for a pilot and student, as well as space in the rear for the one or two passengers is but one innovation.

The wing flaps which run along the entire outside edge of the wings and which are designed as a safety measure, mark a radical step forward in glider design. These flaps will decrease the spinning tendency of the ship and make for slower landing speed.

In addition, Dr. Gross has installed an "airfoil spoiler," a device which has never before been tried on gliders in this country. This is designed for the purpose of changing the gliding angle so that the ship may land in more limited spaces. In other words the normal gliding angle of 21.1 degrees will be brought down with the use of the airfoil spoiler to 8.1 degrees.

The cellophane windows which cover the entire top of the cockpit on a removable frame give passengers a clear view of the heavens while gliding, and there are many windows on the sides, for which Mrs. Gross has even made some attractive curtains, giving the great white ship a de luxe appearance.

Dr. Gross believes that the side-by-side seating arrangement will enable a student to learn the art of gliding much more quickly than in the old type glider where the student had to sit behind the pilot or take his lesson while the ship was on the ground.

Orin Welch School Will Operate Airport

WELCH INTERESTS have purchased 160 acres of land, six miles northeast of Anderson, Ind., which is now being developed into an airport. This will later be operated by the Orin Welch School of Aviation, which has been conducting a school and general flying operations since 1927.

Welch Airplanes, now at Portland, Ind., are moving to this airport where they will build a factory for the manufacture of the Welch lightplanes and motors. This model can be obtained for as low as $795 complete fly-away at factory.

Science and the Military Plane

by ERNEST McGAFFEY

An outline of the many scientific aids that have been employed in aviation with particular reference to the equipment at March Field, California.

MORE and more since the late World War, employment of military planes for combat and observation has the attention of scientists, inventors, air pilots, and military men been turned towards the problem of flight control.

Ships at sea and bodies of men on land can be successfully controlled in various ways and the system of directing naval or army movements has been reduced to practically mathematical precision. But up to, and including the last great conflict between nations, the realm of the air was, generally speaking, a no-man's land to the adventurous bird-men.

True, when the skies were absolutely cloudless and the weather perfectly clear, an airman could see a long way off. But from various angles he was unprotected, since he must pay close attention to his plane as well as keep a sharp outlook for enemy planes. This was particularly the case when there was only one occupant of a plane, who must necessarily be scout observer and combatant all in one. Even with two men to a plane, emergencies were likely to arise which could scarcely be guarded against.

During the World War, when one of our combat planes left the ground it was a free lance. The commander had no control over any of his ships in the air and no means of communication except arm-waving, wig-wagging or by colored Very pistols. All planes might be needed for a sudden counter-attack; dangerous weather conditions might approach; enemy planes might be sighted proceeding toward a vulnerable point inside our friendly lines; or a strong hostile force might be protecting the objective that a few friendly planes were out to attack. Yet this information was unknown to the wandering pilots, as each flyer was fighting his own battle in his own way.

U.S. Army Air Corps Photo

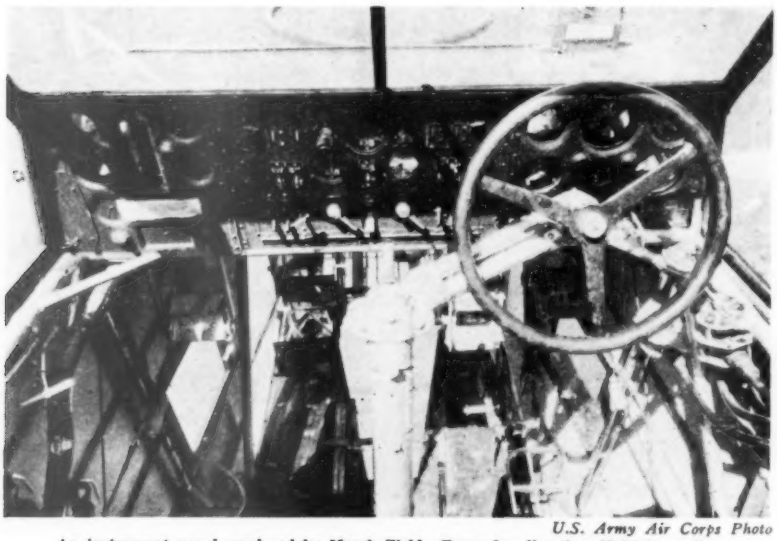
Major Carl Spatz directing a flight by radio.

The resultant crudity of such lack of individual or collective control over single planes or combat groups is apparent. It was guerilla warfare without even the methods occasionally employed by such irregular forces. It developed naturally many thrilling incidents of personal heroism and skill, but to do the most damage to your enemy with the smallest possible loss to yourself is still the basic principle of successful warfare, whether waged by a savage or a civilized nation.

Now compare, if you will, this situation with present tactics. Seated in his aerial office at a safe altitude and position, with maps and log books holding radio weather reports, enemy movements and activities of friendly forces, he moves his aerial armada to advantageous positions in small or large units as he deems necessary. He directs certain elements to land at scattered fields to remain hidden until needed. He draws together large masses of planes for mutual support where enemy activity warrants.

Bombers headed to a distant target are shifted around an approaching storm. A flight of pursuit ships is ordered to intercept an attacking naval air force, follow it to its carrier base and report its location, while bombers are loaded and sent seaward to destroy the mother ship.

All this is made possible by the modern use of radio. Instead of a catch-as-catch-can method of handling air forces, science has stepped in, and by means of radio and weather instruments, has so perfected the movements of military planes that almost all desultory or uncertain activities are eliminated. The withdrawal of air forces in mass, or individually, in case of



U.S. Army Air Corps Photo

An instrument panel employed by March Field officers for directing flight by radio.

severe storm can be accomplished by detecting the proximity of such probabilities and the dangers of lightning, heavy winds, etc., guarded against by recalling the planes to their home hangars.

Just as West Point cadets are trained to pivot and turn in perfect unison under the direction of a single commander, so aerial formations are now controlled in harmonious mass movements. Order has thus been brought out of chaos. All this has been done by radio and its corollary aids. Nearly every tactical ship at March Field is equipped with radio, which is used on every flight. In bombardment this progress has had few obstacles, as the ships are built to carry great loads and have sufficient space for radio officers and operators.

In pursuit, however, many problems arose. The single cockpit of the little fighting plane is crowded with instruments and controls. There seemed no place for any additions. The ceiling, rate-of-climb, and maneuverability of a pursuit plane are largely dependent on weight. The pursuit pilot, therefore, is jealous of any increase in his load.

The pilot, with his machine guns to operate, oxygen supply to regulate, ship to maneuver in formation, instruments to watch, bombs to drop, while encumbered with maps, 25 pounds of heavy clothes and a parachute, is a busy, hard-working man. To add a radio to his list of things to watch and operate seemed to him the last straw of abuse and he fought the idea at first. Hearty cooperation was at last obtained from the pursuit pilots; and great progress has been made.

Early flying machines of years ago had almost no instruments, because airplanes were seldom beyond gliding distance of the landing field. But gradually the uses of airplanes have increased and now they carry great loads, stay aloft hours, and overcome hazards of bad weather. The possibility of a forced landing is of paramount importance.

"Motor instruments" help the pilot to anticipate motor trouble before serious consequences result. Instruments indicating oil pressure, oil temperature, water temperature, motor speed, gasoline pressure and generator charge are all carefully watched by the pilot. Impending motor failure usually gives a pilot warning by these instruments in time to get to an airport for necessary repairs.

As dependability of airplanes increased, they could fly greater distances and navigation instruments became necessary. "Blind flying" added to the aids needed. Modern planes have compasses, artificial horizons, air speed indicators, bank and turn indicators, altimeters, and radios. As planes began flying at great altitudes, tanks of oxygen were carried for pilots and passengers, and carbureters installed with

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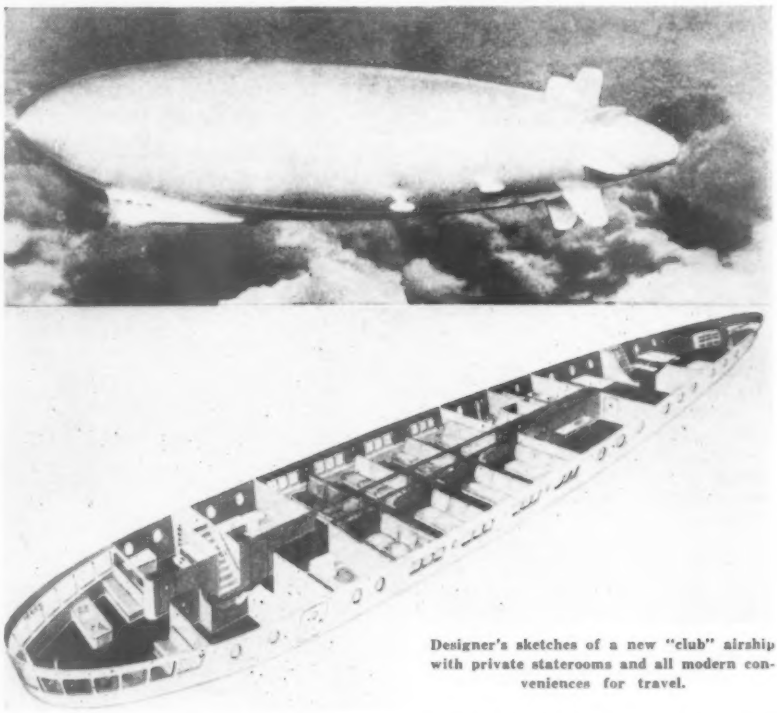
An Advanced Passenger Airship Design



Designer's sketches of a new "club" airship with private staterooms and all modern conveniences for travel.

WE have here an airship deluxe, designed with the object of providing a floating club-house for air-minded members. It is yet in the promotional stages, so far as we know, and the above illustration is an architect's drawing—not a photograph.

Many advantages are claimed for this arrangement over those afforded by a large airplane. Its speed is not high, but then the speed need not be high for cruising and for exploring new country. It can float as a balloon at night with absolute silence while the guests are sleeping.

Les Long's New Hybrid Monoplane

THE accompanying photo shows the new long "HI-LOW," Les Long's latest design. It was built for the purpose of settling the old argument of high-wing versus low-wing. It is both.

Flight tests have proved the ship to be very satisfactory. It has good vision, convenient entrance, good landing-gear arrangement. It combines the speed of the low-wing and the stability and wing clearance of the high-wing type. The tests show that the stability is excessive rather than unstable, and mush landings of 60 feet were made with perfect lateral control due to the wing arrangement.

It is easy to build and costs but little. The photo was taken before the streamlining or fillets had been added, so that it is possible that the performance may be better after these refinements have been made.

This is the new Long monoplane which is both a high-wing and low-wing type, according to it's designer

Our Director of Air Commerce

This biographical sketch of Eugene L. Vidal, Director of Air Commerce, was specially prepared for the readers of POPULAR AVIATION by Frederick R. Neely, chief of the Information Section, U.S. Bureau of Air Commerce. Mr. Vidal holds the commanding position in American aviation and is therefore of particular interest to our readers.

WHEN Director of Air Commerce Eugene L. Vidal insists that airlines use multi-engined airplanes for passenger operations at night, in poor weather, or over difficult terrain such as mountains, the weight of experience backs up his demand. Not only has he studied scheduled air passenger service for years and operated airlines himself, but he has maneuvered his own airplane out of the very predicaments that he seeks to avoid for airline passengers.

His most recent experience along this line took place only a few months ago, after he had become Director of Air Commerce in the Department of Commerce. Mr. Vidal was appointed to the Bureau of Air Commerce in the department as one of three Assistant Directors in June, 1933, and became Director when the Bureau was reorganized in October of the same year.

Carrying out a well-rounded program, seeking to encourage and promote every phase of civilian aeronautics, he is placing a special emphasis on measures aimed to better the lot of the private owner, who previously has struggled along as best he could with little assistance from Uncle Sam. For the private flyer, the Bureau of Air Commerce has revised the regulations respecting noncommercial pilots' licenses, reducing the procedure and red tape; has brought about construction of new airports and improvement of old ones; has initiated a project which should result in the introduction of a safe, small, easily-operated, *low-priced* airplane.

But if the program is well-rounded, it also is complex and the former Army football star, Olympic athlete, Army flyer, and airline executive drives himself every minute of the day and of many evenings and Sundays to keep all of his projects moving. Papers sent to subordinates for action have two- or three-word directions scribbled on the margins. His pace in the corridors is smooth and efficient, but if it were any faster, he would be running.

One day in August he left his office and struck this ground-gaining pace for the short trip to a conference room elsewhere in the building. There he was to meet with airline operators and other officials of the Bureau of Air Commerce for a discussion of the newly-revised airline regulations. The question of multi- and single-engined aircraft was on the agenda.

Reviewing in his mind the remarks he had prepared to make on the subject, Mr. Vidal recalled that particular experience which had forcibly convinced him of the correctness of his theory about the types of operations feasible for single-engined craft and the types for which the Department of Commerce should require the extra safety factor of multi-engines.

Eugene L. Vidal in the cabin plane that he uses on business missions in and about Washington, D. C.

It was during a flight from Cleveland to Washington in the small, single-engine cabin airplane which the Director of Air Commerce flies himself when he makes official trips.

The weather reports given him at the airport in Cleveland were none too encouraging. He knew there would be storms on or near his route, and that the airport at Washington might be closed in by clouds and rain later in the day. They were not so bad that a postponement of his flight appeared to be necessary. Conditions were, if anything, becoming worse, but the indications were that he would be in Washington before the weather became prohibitive for flying.

Accordingly, he took off into the gray sky and proceeded toward Pittsburgh. As he flew along, the ceiling pushed downward and visibility became poorer, but there was no indication that it would be necessary for him to land, so he passed over what might have been Pittsburgh and continued toward Washington.

From the weather map that he had seen before departing from Cleveland, Vidal had learned that he would have to pass between two general storm areas soon after leaving Pittsburgh. Looking at the horizon now he could see these two vast storm centers, one on the left and one on the right. These were not mere local disturbances, they were the centers of great storms many miles in diameter.

He pushed ahead at the airplane's best speed to get between the two storms and beyond them. Reaching Laurel Ridge he realized that he would not be successful. The two storms were about to merge into one, with his airplane at the very site of the juncture.

Visibility had been poor—now it was approaching zero. The only possible way of observing a landmark so as to spot it on the air navigation map was to look straight down, so Vidal opened the window for a better look. A blast of air burst into the cockpit, tore the map from his hand and tossed it into the rear of the cabin. It might as well have blown clear out of the airplane, for Vidal could not leave the controls to retrieve it.

The gust that snatched away the map was the vanguard of a mad horde of swirling winds that pitched and tossed his airplane. Heavy clouds and driving rain blotted out what little visibility he had enjoyed. The Air Commerce Director's plane was bouncing like a canoe shooting the rapids, and he could not see as far away as the propeller on the front of the ship.

He tuned in his radio receiver to the frequency of the nearest radio range beacon but there was a blanket of static that entirely submerged the signals.

With all these misfortunes he thought he could not possibly get into worse trouble. He could, and did. The next

thing was an engine failure. With a pounding heart but with firm hands on the controls, he started an erratic glide, erratic because of the swirling wind currents of the storm. His only hope was for a little clear space somewhere on the mountains below.

But the propeller was still turning slowly, and the ignition was on. There was a cough, an explosion, and the engine picked up again. That welcome roar made the other difficulties seem almost inconsequential. As a matter of fact they still called for some careful and skillful piloting, but they were solved, and a few minutes later Gene Vidal passed out of the worst part of the storm.

He had yet to make his way to Washington without a map or radio guidance, and with low ceiling and poor visibility, but he was familiar with the route and continued on the general compass course he had been flying. At the capital he found that all the scheduled services had cancelled their trips, that his was the only craft aloft in that area.

To make certain that single-engine aircraft carrying airline passengers would never get into any such trouble as an engine failure in a storm over mountains, Mr. Vidal wrote into the revised airline regulations a provision that single-engine craft would be eligible for daylight operations over suitable terrain, in good weather, but that multi-engine craft should be used for the more difficult operations and at night. The operators agreed with him.

The new airline regulations also provided for other safety requirements, including the setting up of operating divisions with an individual operating manual approved by the Department of Commerce for each division, and a procedure for approving the qualifications of employes authorized to pass on weather conditions for the purpose of ordering or cancelling flights.

Eugene Luther Vidal was born April 13, 1895, at Madison, South Dakota, educated in the local public schools, the University of South Dakota, and the United States Military Academy at West Point. At the state university he received a degree in civil engineering, and at West Point won distinction both in his studies and in athletics.

As a halfback on the Army football team, Gene Vidal specialized in streaking down the field to get under Elmer Oliphant's forward passes. He scored 27 of 30 points against Notre Dame in one game. Four letters, two sabres, and a commission in the Corps of Engineers were awarded him as recognition for his prowess as an athlete and scholar.

In 1919 he was a member of the winning track team at the Inter-Allied games in Paris, winning 2nd in the Pentathlon. The next year saw him a contestant in the Decathlon (100-meter dash, running broad jump, shot put, running high jump, 400-meter dash, high hurdles, discus, pole vault, javelin,

(Continued on page 398)

Movable Ramp for Handling Seaplanes

This is the model of the seaplane ramp.

THE Pierson adjustable lift system for seaplanes is designed to save time in handling; reduce chances of damage and keep the ship on a level keel when taking off or beaching.

An adjustable moving platform or truck slides down the inclined track and submerges sufficiently to float the plane, for a take-off. Returning, the plane floats onto the truck and is hauled up the ramp by winch and cable.

How About That Alaskan Cruise?

by LIEUT. LATANE LEWIS, II

TEN high-speed bombardment planes of the Army Air Corps and twelve of the latest type patrol planes of the Navy have recently flown to Alaska. This unusual military air activity along the North Pacific coast has caused a lot of questions to be asked and some protest from foreign diplomats.

Just why should the United States be concentrating her most powerful aerial weapons on Alaska, is what foreign countries are wondering. Will it result in an air base being established there?

Alaska is the only possession of the United States that is not protected by an Army or Navy air base, yet the peninsula is one of the most vulnerable spots to attack in all of our territory. The Aleutian Islands form a stepping stone from Asia and make Alaska the natural gateway to North America and the United States. All successful trans-Pacific flights have followed this route. Moreover, it lies in the great circle steamship route from Asia. If we are to be attacked from across the Pacific, it will most likely come through Alaska.

There have been persistent rumors that certain Asiatic countries are looking with covetous eyes upon Alaska and although vigorously denied by them, the United States should be ready for any eventuality. Those "in the know" in international affairs realize that there is at present a serious crisis rapidly developing between two foreign nations only a stone's throw away and should armed force be used, Alaska will very likely become involved.

How effective would our air force be in defending American rights should it be called upon to do so? That is what our military and naval leaders wanted to find out. They wanted to test the mobility of big ships in massed long distance flight.

While the flights were made in easy stages, they provided data on what could be done if a hurry call should come. The Air Corps "Thunderbird" Squadron of Martin B-10 bombers had a cruising speed estimated at 200 miles per hour. The distance covered between Washington, D. C., and Fairbanks, Alaska, was 3,209 miles. If the squadron had pushed straight through, instead of stopping overnight at various points, they could have made the trip in 16 hours.

The Navy flight showed strikingly just how close these new long-range, high-speed air dreadnaughts have brought Alaska to our Seattle, Washington, Naval base. The Martin patrol planes used on this flight covered a distance of 800 miles over water to Dutch Harbor in the Aleutian Islands. This type of ship has a speed reported to be 140 miles per hour, which would put this important strategic point in our air defense plans just a little under six hours away.

It is evident from these flights that the United States should establish a base for military and naval aircraft in Alaska, if only a small, skeleton force that could resist a surprise attack for a few hours until support could arrive from the United States.

How a Modern 'Chute is Constructed

by GEORGE W. de GRANGE
(Luke Field, Hawaii)

The author analyzes the modern parachute and completely describes the details of its construction. Contrary to general opinion, the parachute is a simple device—but it isn't.

PARACHUTE design and manufacture, contrary to popular belief, is in itself a highly specialized art. Consequently, there are innumerable factors that must be taken into consideration, only one of which is the assurance of a slow rate of descent, but this feature alone by no means spells complete safety. Other factors, just as important, must be studied and provided for. Typical problems are the rapidity of opening or "deployment," lack of oscillating tendency, degree of steerability and the overall strength factors which must be met with a wide margin.

It is necessary that all of these features be embodied in the finished product and at the same time, this product must also combine lightness, compactness and simplicity of operation and maintenance. The manner in which this is accomplished, after years of endeavor, is quite interesting.

The first step in the actual construction, naturally, centers on the "canopy" or the actual parachute itself. An area sufficiently large to accommodate 200 pounds or more and to lower that weight at the rate of 20 feet per second or less is required. Coupled with the determination of the diameter itself, which is generally 24 feet, is the selection of a suitable material possessing sufficient strength characteristics with which the structure is to be constructed.

For this purpose high-grade Japanese white silk has been found satisfactory, having a tensile strength in the warp and fill of at least 40 pounds. Tear resistance must aggregate at least 2 pounds. The weight of the material, a vital factor, must not exceed 2.2 ounces per square yard.

Another and slightly cheaper material, possessing these characteristics and known commercially as pongee, has been developed by American manufacturers and is sometimes used although the life of the silk is not so long as that of the higher grade. Specially prepared cotton has also been used to advantage but it too has a short life making construction from this material impractical. Its only advantages are those of low cost and availability in times of national emergency.

Selection of suitable materials must also be made with other objects in mind. An essential factor is that the body of the cloth must be loosely woven to assure the proper amount of porosity. If, however, it is too loosely woven, a hazardous rate of descent will be inevitable due to the decrease of resisting properties unless the size of the canopy itself is increased proportionately. The latter is usually impracticable.

U.S. Navy Photo

A seat type parachute pack, which in service forms a cushion for the pilot's seat. This is a common type in military and naval aviation.

Contrary to popular belief, porosity must be present in the proper degree, otherwise the entrapped air will have no means of escape except through the upper vent. This is, by necessity, wholly inadequate to take care of such large amounts of air. Without the proper amount of porosity, "spilling" would take place, always providing that the opening shock is not great enough to explode the entire canopy around the periphery of the skirt.

Suitable material will show a thread count of the warp and fill of from 80 to 150 threads per inch. This fabric will sufficiently resist the air yet still pass sufficient air to prevent splitting during the opening shock. Experience has shown that this suitable material, depending upon the thread count, will pass from 80 to 140 cubic feet of air per minute through each square foot of its surface.

Upon the selection of a suitable cloth it is then cut into wedge-shaped polygons or "gores," the number and size depending upon the shape and size of the finished canopy. These are in turn cut diagonally on a 45-degree angle into four segments. The resultant seams and sub-lateral bands aid materially in strengthening and preventing any potential tears or runs extending for any great distance.

The completed gores are next sewn together with a French "Fel" seam with four rows of stitching using a silk thread with a tensile strength of 9 pounds. Completely encircling the joined panels, at top and bottom, one-inch strips of loosely woven silk tape with a tensile strength of 300 pounds are sewn by means of a "Fel" seam, also with four rows of stitches. These are to be known as the upper and lower lateral bands which are really the strength-giving sections of the entire 'chute.

Should these become severed at any one point, the result would most likely be the total and complete collapse of the entire unit. With this completed the finished structure is known as the "canopy."

Shape of the canopy is determined by several factors i. e., the desirability of incorporating either steerability, simplicity or anti-oscillating features. So far, it has been impossible to combine all of these features satisfactorily in one type although one designer has had partial success.

While the concave effect must be followed more or less as the most desirable manner in which to entrap air, proper design of the curves must be utilized to advantage in causing the escaping air to eddy up over the top surface with resultant eddies and partial vacuum. The help such a design may contribute to the sustenance of weight is considerable.

At any rate, the more radical designers are paying particular attention to this feature since streamlining and air-flow ratios have recently become the vogue.

Despite the concave shape, one leading type has become known as the "flat type," due solely to the fact that it can be laid, without wrinkles, flatly on the ground. This model claims simplicity of operation and maintenance.

Another, the "Lobe," wherein the periphery is drawn well in under the body, when deployed, has been more than successful in combating oscillation. A third, the "Triangle," incorporates a reasonable degree of steerability with a lack of oscillating tendency although maintenance is complicated due to its ingenious design.

At the apex of the canopy a circular opening, the vent, is provided, generally about 18 inches in diameter, which takes care of air leakage thereby reducing the shock load at the time of open-

ing as well as venting all excess air not escaping through the fabric which would otherwise spill under the skirt and set up violent oscillation.

Attached directly to this vent is a small replica of the main canopy, with an approximate diameter of 36 inches, this is called the "pilot 'chute." Some models employ springs built into the pilot 'chute itself while others use fabric ejectors in projecting the apparatus into the air-stream. Their one purpose is to assist pulling the large canopy from the pack and are worthy of the title "Sky Anchor."

The pilot 'chute, once in the air, resists the drag of the falling body thereby causing the main canopy to be more readily drawn from the pack and parallel to the line of greatest resistance, greatly facilitating the opening. While use of this feature is mandatory and not essential to an opening the speed with which it takes place is greatly increased.

Shroud lines form the skeleton of the distended canopy. Ranging in number from 20 to as many as 40, in proportion to the number of gores. There is generally one line to each gore. These lines, 3/16-inch in diameter, are constructed of losely woven thrown silk around a four-strand core having a tensile strength of 400 pounds each.

Each line is continuous from its point of attachment to the "D" ring on the harness lift-web over the canopy and down the opposite side to its point of attachment to the harness.

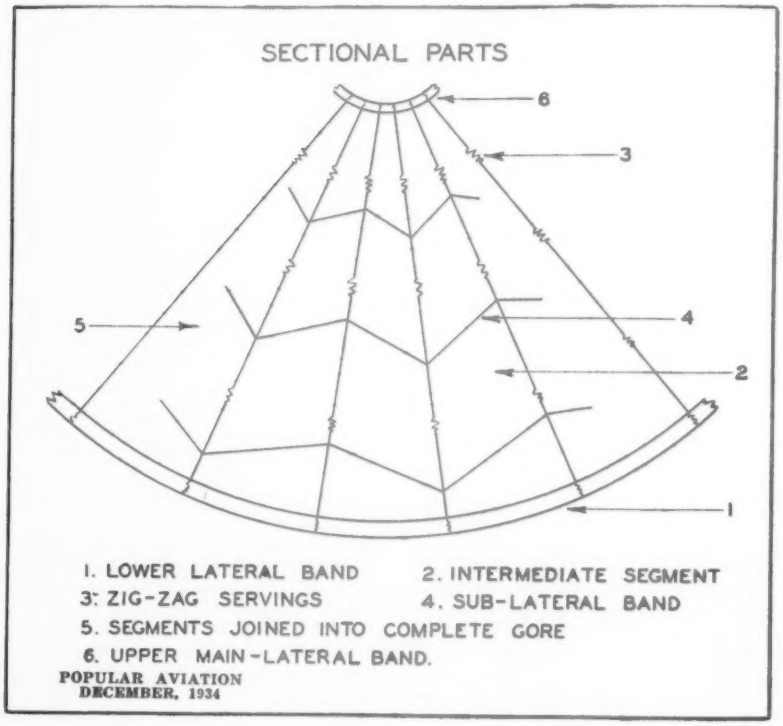
The lines at their point of attachment to the "D" rings are secured by two half-hitches around the bight and two inches of zig-zag sewing. Length of the lines between the harness and their point of attachment at the skirt is determined by tests conducted with a particular shape and size of canopy in view. The proper length, with one certain canopy, is determined by the distance from the skirt at which it shows the greatest degree of stability and a minimum of oscillating tendency.

At the point where the line meets the skirt it is again sewn zig-zag for a distance of two inches. It next enters the channel in the silk, created by the seams where the gores are sewn together and runs the entire length of the canopy, across the vent and down the opposite side in the same manner.

Between the skirt and the apex, each individual line is sewed five times to the body of the silk with zig-zag sewing, sufficient "flex" being allowed between sewings to permit the previously predetermined conformation of the canopy.

Harnesses are generally constructed of soft three-ply linen or cotton webbing with a tensile strength of 2,800 pounds. Fittings are of high-grade steel forgings, three of which secure the harness to the wearer, one on the breast and one on either thigh. Recently improvements have been made so that it is possible to incorporate these three fittings into one which may be fastened with a single movement.

Other smaller supplementary fittings are so arranged as for easy adaptability of the harness to the largest or smallest persons with a minimum of effort. Webbing-straps, back-pads and kapok seat-cushions are so designed that they contact the proper points of the anatomy assuring comfort and no undue strain despite the most prolonged of delayed drops.



Courtesy of Irvin Chutes

With the canopy fully distended, the details of the 'chute can be clearly seen.

Pack-carriers, which have made possible the present manually operated parachutes, are the pride of the manufacturers. They assure not only quick and positive openings but provide a container for the folded canopy and lines with a minimum of bulk and a simplicity of operation.

While there are several types, the "flap" type is, by far, the most simple although the fundamental principles all remain the same. Constructed of 12-ounce duck fabric over a wire framework, the pack has four flaps or sides.

After the lines and folded canopy have been placed on the pack, these four flaps are drawn together over the 'chute itself and secured with cones and grommets. Locking-pins on the rip-cord, inserted into the cones, effectively hold the flaps together leaving no portion of the folded parachute exposed.

Rubber opening elastics, secured to the outside bottom of the pack, are then brought up over each side and are hooked into an eyelet close to the flap's edge. When the rip-cord is withdrawn from the tapered cones these rubbers jerk the four sides quickly away in as many directions, releasing the pilot 'chute and allowing the canopy to fall out into the air-flow.

Retaining pockets or rubbers in the bottom of the pack hold the folded lines which are then drawn from the pack in proper sequence, free of snarls when the canopy begins to string out and open.

The finished product, weighing less than 18 pounds, can be provided in many styles to meet the individual requirements of the user. Over-size canopies, generally 28 feet in diameter, are available for those that might desire the slower rate of descent that these afford.

Packs are manufactured in styles to fill almost any need consisting of back and form-fitting packs, generally used in lighter-than-air craft. We have the

(Concluded on page 400)

The Bellanca Bimotor Bomber

(See Front Cover)

One of the most highly developed bombing units in the service. It retains many of the well-known Bellanca characteristics in addition to many new and interesting features.

A NEW twin-engined bomber, featuring high speed, large load carrying capacity and excellent maneuverability, produced by the Bellanca Aircraft Corporation, New Castle, Delaware, may be used for bombing, photographic-mapping work, troop transportation, ambulance service, cargo carrying or as a fighting unit.

Upper wing panels are of two-spar construction, having closely-spaced ribs to take care of high load capacity and performance. Wing ribs are of plywood construction, the wing proper being entirely fabric covered. The wings can be folded back, enabling the ship to be hangared or stored in smaller space than normally required for a huge plane of 76-foot wing span.

Auxiliary wings and lower stub wings are of welded chrome molybdenum steel tubing covered with fabric, while the upper stub wing, of similar construction, is covered with aluminum alloy.

A 90-gallon, welded aluminum fuel tank is carried in each of the two upper stub wing units, between the engine nacelle and the fuselage, and the rear section of each engine nacelle incorporates a cylindrical welded aluminum fuel tank of 60-gallon capacity, making a total of 300 gallons.

The all-metal nacelles are of the latest NACA type with full NACA ring cowl. Their design incorporates the latest findings and best practice in engine-propeller location relative to the wing for the purpose of securing the utmost efficiency. Placed on the top wing at the point of junction of the main upper wing panel and the upper stub wing section, the nacelles house two Wright Cyclone 1820-F-3 engines, each developing 715 h.p. at 7,000 ft.

The fuselage is of chrome molybdenum steel tubing, fabric covered. In the nose of the fuselage is the gunner's cockpit, equipped with scarf ring mount, etc., aft of which is the pilot's cockpit.

A three-quarter view of the Bellanca bomber as employed for land operations. Note the characteristic Bellanca wing group and landing-gear.

Large, non-shatterable glass windshield and roll-down type cockpit door windows of the same material afford unobstructed vision. The bombardier's cockpit, to the side of and just below the pilot's cockpit, is provided with pyralin windows placed low-down in the sides of the fuselage.

Six litters may be installed for ambulance use, provisions as a troop-transport for carrying 18 soldiers, or for handling heavy cargo. The wide cabin is more than 13 feet long and six feet high.

Beneath the cabin is a 180-gallon belly-tank, which, in combination with a removable 200-gallon tank in the cabin, permit carrying 380 gallons of extra fuel. This, with the 300 gallons normally carried in the upper stub wing tanks, provides for a 1,500-mile range with full normal load. Beyond the cabin section, are the rear gunners' positions.

The design and arrangement of the tail surfaces, including the two complete auxiliary rudder and fin units, are such as to provide easy and positive operation on a single engine without maneuvering the plane to awkward positions to maintain control during flight.

Features of the Bellanca Bimotored Seaplane Bomber of utmost importance to naval and military personnel are its unusually high maximum speed of 175 m.p.h. for a full-sized, high-capacity bombing seaplane, providing a performance never before available in a plane of similar size, type or capacity; the ability to carry more than 3,000 pounds of payload combined with a maximum range of 1,500 miles and the aptitude to fly and maneuver on one engine, with full load and at 8,000 ft., without difficulty or abnormal flying attitudes.

Floats are of all-metal riveted aluminum alloy construction, fitted with retractable water rudders and beaching gear attachments. Bellanca practice has been followed in the float installation, providing for mounting the undercarriage at the intersection of the lower stub wing and auxiliary wing strut, permitting the installation without the use of external brace wires, tubes, etc.

Figures on the Bellanca Bimotored Seaplane Bomber are as follows:

Wing span	76 feet
Length overall	45 ft. 2 in.
Height overall	16 ft. 5 in.
Useful load (1,500-mile range)	8,387 lbs.
Weight empty (actual)	9,362 lbs.
Weight of fuel (680 gallons)	4,080 lbs.
Weight of oil (45 gal.)	337 lbs.
Armament, ammunition, bombs	3,250 lbs.
Gross weight	17,749 lbs.

PERFORMANCE:

Top speed (7,000 ft.)	175 m.p.h.
Cruising speed (12,000 feet)	165 m.p.h.

Here we have the Bellanca bomber equipped with floats for over-water operations.

The Unheralded Airmeet

THE Air Carnival held at the Curtiss-Reynolds airport in Chicago, October 3-6, was an outstanding success and a credit to its promoters despite the lack of cooperation of the local press.

We don't know why the newspapers ignored the meet, for there were a number of professional flyers of national reputation entered in the various events, such as Harold Neumann, Roger Don Rae, and that premier exhibition flyer, Roy Hunt of Oklahoma City. But without the doubtful blessings of the press and ballyhooing of high-powered publicity experts, it was a darn good show!

It was billed as an "air carnival" and that is exactly what it was; there was a spirit of friendly rivalry and good sportsmanship throughout the meet. There were various events on the schedule each day, such as a women's race, a free-for-all sportsmen pilots' race, parachute jumping contests and the usual army maneuvers. Roger Don Rae, flying his Menasco-powered, Keith-Ryder racer, was a consistent winner, taking first place in all the speed events for professional pilots. Harold Neumann, flying a Howard Special, won second place in these events, and then after each race gave a demonstration of aerobatics while traveling at power-dive speeds ranging from 250 to 300 miles an hour.

No one could watch the beautiful exhibition put on by Roy Hunt and not be thrilled, but the ease and superb skill with which he handled his ship instilled confidence as well as admiration. Long banners of trailing smoke traced the intricate maneuvers against the sky—tight spirals, loops, spins and every type of roll, upside down and back. Then bringing the ship down in a vertical side-slip and rolling up in front of the stands, Roy would set the brakes and with a final blast from the propeller, the ship would execute a graceful bow much as a trained animal in the circus.

The most amusing race on the final day, was the BVD handicap. The contestants and their aides were stationed rather *far* out on the field (for obvious reasons). The rules called for three laps around a given course; after the first lap the pilot had to land, remove his trousers and fly the second round a-la-BVD's, then recover his wardrobe and make the third and final lap of the race. The chief difficulty was trying to land near the pants—some of the boys had a long run to make, much to the joy of the cheering spectators. The first prize for this event was a new pair of shorts.

Atcherly, the English flyer, may have started the fad of "crazy flying," but our local comedian, Dick Greinier, is an artist in his own right. His amusing skit of the old farmer learning to fly sent the customers into hysterics,

(Concluded on page 394)

The Aero-Sportswoman

by JOAN THOMAS

A group taken of the North Central Section of the 99 Club, Ypsilanti, Michigan, September 23, 1934.

"A NEW field for women's enterprise seems really established, when a 'magazine about women and flying' takes its place among monthly periodicals."

That was the reaction of the *Journal of the American Association of University Women* to the advent of *The 99er*. This is even more true of the *Airwoman*, which this month succeeds the magazine published since November, 1933, by the 99 Club, official organization of women all over the world who are licensed to fly aircraft.

Airwoman will serve as the official organ of the activities of the Women's National Aeronautical Association as well as of the 99 Club. And just as *The 99er* has been the most important bond between the women flyers, the *Airwoman* will go much farther and unite the work and interests of all women who are working for, or in the aviation industry. It will be invaluable in bringing the two organizations together, and since both are working toward the same goal of fostering and promoting all phases of aviation, their united efforts will be more effective.

A series of special numbers are scheduled for the coming year featuring: the pioneer women flyers, the aero-sportswomen of today, tomorrow's pilots, gliding, racing, and women pilots around the world. In addition many of the regular departments of *The 99er* will be continued, and since this is a more general magazine, there will be even articles on fashion and the culinary arts—written, of course, from the airwoman's point of view.

Amelia Earhart, Phoebe Omlie, Ruth Nichols, and everybody else are getting behind the new adventure and Margaret Cooper and Clara Studer are working overtime! The Aero-Sportswomen and POPULAR AVIATION are glad to welcome this new publication in the aeronautical field and certainly recommend it to your attention and urge your active cooperation and support.

As a member of both the W. N. A. A. and the 99, the editor of this column feels that this is the most important thing that has been attempted by either organization. For the *Airwoman* is not only a flyer's magazine, but an honest attempt to share with all women who are not yet airwise, the fascination that flying offers as a sport and a profession, or the joy and convenience which it offers to travelers.

* * *

Alice Hirschman of Grosse Pointe, Michigan, was elected governor of the North Central Section of the 99 Club at the annual meeting held in Ypsilanti, Michigan, on September 23rd.

The members of the organization, who were fortunate enough to attend this meeting, were entertained at a delightful luncheon in the home of Mrs. Mabel Britton, the retiring governor, who was elected National Secretary of the 99 Club at the Cleveland meeting.

The Ohio chapter was represented by Arlene Davis, Ann Barille, Clara McCormick, and Mary Winstanley. Clayton Patterson and Gayle Pond drove over from Chicago (Ask 'em what they think of the Irish Hills in September!) and in addition to Mrs. Britton, the Michigan chapter was represented by Gladys Hartung, Faye Davies, Alice Hirschman, Margaret Horton, Helen Lehtio, Jeannette Lempke, Mary Von Mach, and one student-pilot guest, Florence Swanson.

The new governor has already set an enviable example for her constituents by winning the Amelia Earhart hat contest for September. Alice was fortunate enough to be able to take part in both the Indiana and Michigan air tours and her official record for the month was 27 airports. The award, if you remember our story on the con-

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Recent Doings in Washington

by KEITH J. FANSHER

Observations made by the author while making an investigation in our Capitol. He reviews the statements made by General William Mitchell and Eddie Rickenbacker before the Federal Aviation Commission.

I WAS in Washington analyzing, or trying to analyze that whole strange, indescribable thing that has evolved in this last year and a half, called by various names but roughly corresponding to what is generally known as the New Deal.

Washington, the city which has known no depression, was and is a madhouse, a maelstrom of new and ever-changing currents of people, and plans, and politics, and policies and programs. Projects involving billions and extending years into the future were being formulated.

Older, earlier ideas were being revamped or scrapped. Still other billions were being shovelled out on projects being pushed to completion. Everyone hurrying, everyone trying to keep up with the whole situation, which whirled and changed and scintillated with its thousands upon thousands of individual aspects and angles in a dazzling, fascinating, bewildering maze of over-all governmental direction and activity.

Suddenly, abruptly, it almost seemed that the clock had stopped. The clatter and drone of conversation and discussion in government offices, in hotel lobbies, in the street, everywhere, was stilled. The former thousand-and-one topics of conversation everywhere became just one topic. And that one was —aviation.

What had happened?

A dynamic, colorful, straight-speaking man, Brigadier-General William Mitchell by name, had testified before a Federal aviation commission inquiring into air affairs. This man who a few years ago became a by-word overnight in American households because of his outstanding and un-afraid comments and criticism on the conduct of American aviation affairs, was talking to the nation.

And it was not so much that what he said was of a sensational nature. Almost everything that Mitchell ever says is sensational. The man is made that way. But here the simple fact was that a man recognized as an authority on aviation was voicing his ideas. So the nation listened, even Washington unanimously listened, cold, hard-boiled Washington, "toughest" audience probably anywhere in the world today. And Washington continued to listen throughout the hearing, to testimony including that of Captain Eddie Rickenbacker and others.

Washington is the busiest place on the planet. From all appearances, too, it is the most prosperous. Rents, prices, values of all kinds are at high peaks. More big plans are at stake there than

General William A. Mitchell (seated) is gleefully talking over his plans with Eddie Rickenbacker, who, by the way, seems to be in accord with the General's views.

is generally realized. Yet Washington dropped everything and began unitedly to think aviation.

Yes, it is easy to get attention for aviation even in Washington, busy, pell-mell, hurly-burly though it is. And in this respect, Washington pretty much and pretty well reflects the sentiment of the nation today, so far as can be ascertained. From the president on down, there is a much more intelligent interest in the subject than there was a year ago.

It is my observation and my belief that both Washington and the country are becoming again distinctly air-minded and I think it is high time. From everything that can be learned, I think aviation can count, from now on, upon a much more real and substantial and worth while interest and support, and less sentimental, frothy, mushy, and so downright harmful show of interest than in the past. That is a good sign for the art and science of flying and for the flowering of these things into concrete and definite happenings.

The truth appears to be that the United States is now gradually developing into a truly air-minded nation, and I was able to obtain clinching assurance and verification of that observation in Washington. This is one of those vague, indefinite ideas which defy hard-and-fast nailing down, but which impresses itself unmistakably upon you.

I suspect that the Army air mail business of early the past year resulted in going more deeply and permanently into the over-all air policy of America than most persons realize. I suspect that the innate pride and patriotism of the average American citizen was stung more deeply by the deaths and disasters attending that situation than is generally appreciated.

I know that the administration feels very deeply on the whole question of military and civil aviation. Incidentally, in passing it should be noted that there is an important political angle. The sentiment in informed quarters is that the severest defeat the administration yet sustained with the public resulted from the air mail situation.

Mitchell's explosion and the almost simultaneous announcement of a reorganization of the Army air force drew a great deal of attention and apparently almost obscured what the writer believes to be the most important part of the whole question—that is, that the indications point to expansion of military aviation. No definite announcement has as yet been made, but there is reason to believe a greatly enlarged air force in this country is a very likely development over the next few years. Immediately, as a part of the reorganization plan, the fleet of ships attached to the new general air headquarters will be increased in numbers to some extent.

The Baker air investigation committee report preceded the War Department's announcement of its new

deal. This report was one of the things which drew Mitchell's fire. The reorganization involves creation of an army general headquarters air force under immediate command of the Army chief of staff, General Douglas MacArthur. It relieves Major-General Benjamin D. Foulois of command of practically the entire combat force. It sets up 48 units of the Army's flying force, most of the military planes in the service, under the new organization. Additional units, especially mobile service and maintenance squadrons, will be organized later to supplement the orders.

Insiders appeared to believe that this whole change could be regarded as a preliminary to a somewhat enlarged machinery for national air defense. There is still nothing positive along this line, but this impression is gaining ground fast.

A general headquarters air force commander is expected to be appointed soon. He is to be responsible to the chief of staff, not to the air force head. Other air force tactical units are to be under corps area commanders.

Headquarters of the new force will be at Langley Field, Va. According to the recommendation of the Baker committee, the general headquarters air force would be considerably expanded, reaching a total of perhaps 2,320 serviceable combat planes, or about 60 percent more than at present. It is understood that in the last few months practically all the present year's appropriations for new airplanes have been obligated. This has been since the taking over of procurement of new planes from Major-General Foulois by the War Department and the chief of staff's office.

As things now stand, there is a strong indication that the make-up of the new Congress will be such as to make it likely that the air force can be enlarged considerably. It is felt by many experts that the necessary appropriations will not be withheld. Those who make it their business to keep in touch with the public's attitude on things of this nature assert that the public not only would favor such a move but even might not be willing to brook interference with such a plan.

Nevertheless, there is no denying the fact that the whole military aviation situation is in a state of nervous uncertainty. The Baker air committee and the War Department order acting on its findings came abruptly, before the President's special commission recently appointed to study the whole aviation problem of the government had been given an opportunity to make its report. There were many who asserted the department's action had been hasty and ill-timed.

Some feel that the new action has created a situation where a showdown is necessary covering the whole question and they feel that the showdown will have to take its basis in action from no lesser origin than the White House itself.

It is even felt by some that the new

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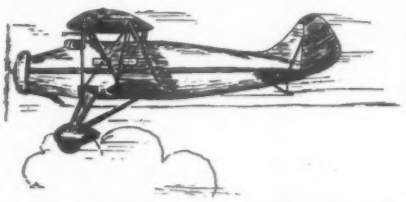
A Few More Dream-ships for You

Our readers contribute a few of their own ideas on the design of airplanes for various purposes. Why don't you submit your ideas?

WELL, fellow dreamers, here's a fine mess of three good drawings and one very original idea—almost an invention in fact.

At the top of the column is a speedy-looking cabin job by Richard G. Anderson, 122 Emery Street, Portland, Maine. He has been so much impressed with this design that he has built a flying model of it so that his idea is now a flying reality. Not so bad—not so bad.



Away goes Richard Anderson's cabin biplane to a winning position. He has not only drawn this sketch but has made a flying model of it as well.

Second from the top of the heap is a really clever drawing by Bill Straley, 2412 E. 55th St., Kansas City, Mo. This open type biplane is a conventional biplane, to be powered with a Warner Jr. 90 h.p. engine. The span is 22'-0", upper wing, and 19'-0", lower wing. Mr. Straley would like to get in touch with other lightplane fans.

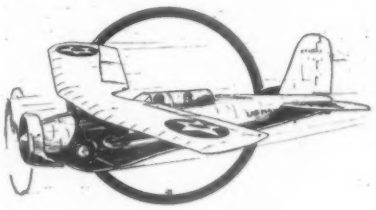
Norman Barker sends us a clean-cut pen sketch of the Curtiss (X)F.12.C.1 with its characteristic folding landing-gear.

But the real job that smacks of originality to the tenth power, is the design at the extreme bottom of the column. This is the production of Mr. Thomas N. Dodd, Jr., Rochester, N. Y., who flies against modern conventionality and dares to show a pusher-type plane. And, further, this pusher employs a novel propeller system by which the propeller rides on the tail-boom.

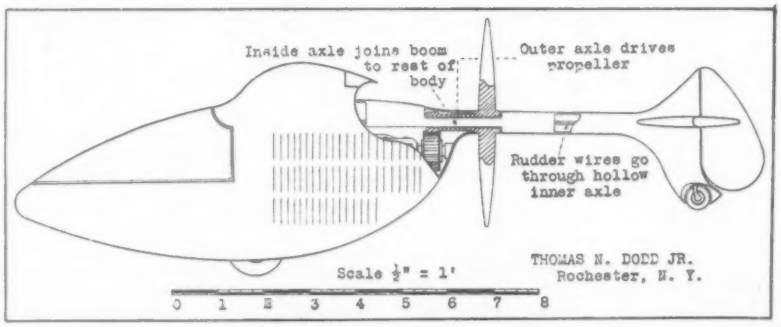
In the first place, the tail-boom or beam extends from the body and supports the tail group. Surrounding the boom is a hollow shaft that carries the propeller, the left-hand end of the tube engaging with gears on the engine so that the prop turns around the boom. This may be original to Mr. Dodd, but along about the wartime, a very similar propeller arrangement was used on the Gallaudet plane, the propeller in this case running around the entire fuselage instead of the tail-boom.

And while this design has many points of merit, compactness being one, yet there is a serious structural difficulty in the way. In short, the boom must be kept so small in diameter to insure a small propeller hub that the beam is weakened at the point of the greatest bending moment. If the walls of this tube were made sufficiently thick to withstand the bending, the boom would be far too heavy. This is unfortunate for the idea in general is good.

Bill Straley is not only an aviation fan but is also an artist of no mean ability. He has drawn up this O.C. job to the queen's taste and it is a good-looking job at that.



Norman Barker has given himself up to drawing, and does not pretend to be a designer. It is a mighty fine sketch of a Curtiss (X)F.12.C.1.


Inside axle joins boom to rest of body
Outer axle drives propeller
Rudder wires go through hollow inner axle
Scale ½" = 1'
THOMAS N. DODD JR.
Rochester, N. Y.
0 1 2 3 4 5 6 7 8

The Development of Aircraft Carriers

by ALFRED CELLIER

A short history of the rapid development in Navy airplane carriers, the ships that carry the "eyes" of the Navy to the battle zones.

FROM time immemorial, navies have always sought in wartime for information concerning a hostile fleet in respect to its strength and disposition. Such information is of vital importance in both offensive and defensive tactics.

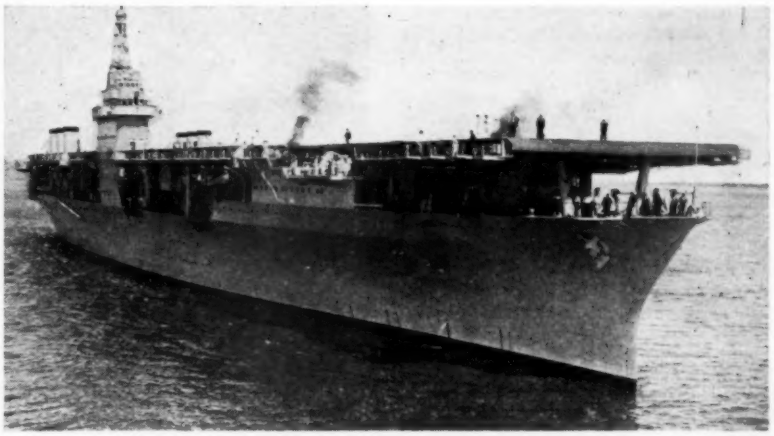
During the Spanish-American War, at Santiago, a balloon on shore was used to find out whether the Spanish fleet was in the harbor, after all other methods failed. And even before this, as early as the Civil War, balloons were employed for observation posts.

It remained for the World War, however, to demonstrate the value of the aircraft carrier, for by this time, heavier-than-air craft had been adopted by the various powers as an integral part of their naval forces. Prior to the World War, crude experiments had been carried out, flying from improvised decks on surface vessels, and also in hoisting seaplanes from comparatively smooth water. The difficulty with the improvised deck, however, lay in the inability of the parent ship to retrieve its airplane and in having a part of its main armament covered in the event of an immediate action. Nevertheless, these experiments conclusively proved the feasibility of carrying aircraft to sea, where they could be used for spotting purposes.

The first experiments along this line were carried out at Hampton Roads, Virginia, when Eugene Ely successfully flew a fifty horsepower Curtiss landplane off a hastily built platform on the cruiser Birmingham, November 14, 1910. Again, on January 18, 1911, it was Ely who made the first successful landing on the deck of a vessel, on the cruiser Pennsylvania which was then lying at anchor in San Francisco Bay.

With the organization of the first naval air detachment, 1913, the airplanes were embarked on a naval collier and transported to Guantanamo, Cuba, for fleet operations where they made many notable flights. In January, 1914, the old battleship Mississippi was turned over to the aviation detachment, and when the fleet was ordered to Mexico for the occupation of Vera Cruz, it carried two seaplanes which were hoisted in and out when reconnaissances were necessary. This ship was not, however, fitted with a flying deck.

Meanwhile, the British Navy had been carrying out similar experiments and fitted out the battleship Africa with a platform over the forward gun turrets in 1911. Lieutenant C. R. Samson, later famous for his war exploits, successfully piloted the first plane launched from shipboard. A year later, the battleship Hibernia was similarly fitted out and in 1913, the light cruiser Hermes was equipped with some seaplanes and accompanied the Grand Fleet on the maneuvers in July of the same year.



A modern aircraft carrier with its broad landing deck, bifurcated stacks and other special equipment for handling naval aircraft.

With these experiments as a background, when the war broke out over Europe in August, 1914, the British Admiralty immediately proceeded to adapt and convert certain vessels for seaplane and aircraft carriers. The first of these to be taken over were the cross-channel steamers Riviera and Engadine in August, and afterwards, the cross-channel steamer Empress, in October. These were utilized then for seaplane carrying only, as landplanes could not be launched from them.

Meantime, the old cruiser Hermes had been ordered in to refit and appeared again, in the middle of October, with a specially built "flying-off-deck." However, the operations of this first true aircraft carrier were not a notable success, for two weeks later she was torpedoed and sunk while on patrol duty in the North Sea.

About the time that the Hermes had been ordered in for conversion, the Admiralty had decided to take over the old Cunard liner Campania, and to fit her out with a flight deck. Her speed of twenty-two knots would allow this ship to keep station with the Grand Fleet. The Campania had a gross tonnage of twenty thousand tons and plenty of room was available for the storage of aircraft and the machine shops for the upkeep of the machines. She appeared ready for service on April 17, 1915, with a one hundred and twenty-foot flying deck and a complement of eleven seaplanes and one landplane. She was immediately assigned to the Grand Fleet, then at sea.

In the meantime, the converted merchant steamer, Ark Royal, of seven thousand four hundred and fifty tons, with a speed of eleven knots, had been commissioned. The Ark Royal had a straight flight deck, the sheer of the vessel having been cut down. A hangar was provided in the cargo hold, capable of accommodating ten airplanes.

Like most carriers of that early period, the bulk of these airplanes were seaplanes which had to be hoisted in and out. On January 13, 1915, the Ark Royal was ordered to the Dardanelles where she was to see a year of service or until the final evacuation of the Gallipoli whence she left for Salonika. The Ark Royal was soon followed by the Ben-My-Chree.

The next vessel to be converted to an aircraft carrier with a flying deck was the Vindex, which was a former Isle of Mann passenger steamer. The Vindex was commissioned in September, 1915, and was followed by the Manxman, another steamer similarly fitted. Then came the Furious, a battle cruiser which was being built for Brazil and which was seized upon the outbreak of war.

The Furious appeared with two flying decks, one forward and one aft. The object of this was to take off from the forward platform, while the rear deck could be utilized for retrieving the airplanes. The Furious was followed by the Pegasus, the Nairona, and the Raven. The Vindictive was the final carrier to appear during the war period, while two others, the Argus and

Eagle, were nearing completion but did not get to see active service.

Both before and during the time that the flying deck became a reality, the seaplane carriers took their broods on many adventures, particularly along the German coast, where raids were made on the Zeppelin sheds. Each such operation necessitated the hoisting in and out of the seaplanes and, on many occasions, the seaplanes were damaged or unable to take off in the heavy seas. Other operations, during the Dardanelles campaign, allowed the early carriers to operate in quiet waters and also to shore base their landplanes. During these periods they spotted for the guns of the fleet against land batteries.

The need for naval aircraft in other parts of the widely scattered war zone caused other surface ships to be used temporarily on such missions and, off the coast of East Africa, the former ocean liners Himalaya, Laconia, and Mancia carried a seaplane in temporary hangars on their decks. The hangar of the latter, operating far from her home station when assigned as a seaplane carrier, was improvised from bamboo and grass, such as was to be found along the jungle-infested coastline, but this did not diminish her qualities.

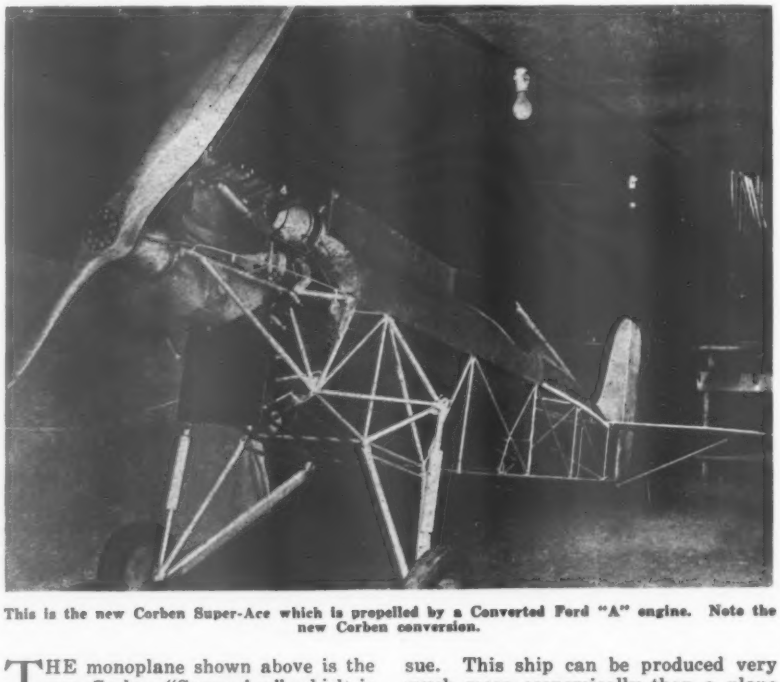
Gradually, the flying deck was evolved. Operations from these airplane carriers are of such historical importance that mention of their service cannot be overlooked. The first landplane to be flown off the Campania was a Sopwith seaplane which had wheels fitted under the floats. The Campania was steaming into the wind at seventeen knots when Flight Lieutenant W. L. Welch took off.

The run took up one hundred and thirteen feet when the plane gracefully soared into the air, and the wheels were dropped. It was then necessary to land alongside the parent vessel and be picked up. This sort of thing continued for some time but gradually the planes were received on board in the same manner. At the end of 1915, the Campania was again ordered back to the shipyards to have a longer deck provided so that two-seater reconnaissance airplanes could operate from her.

Many attacks were carried out against Ostend and Zeebrugge in which airplanes spotted for the fleet during 1915 and 1916, while operating off airplane carriers. But it remained for the Battle of Jutland, in May of the latter year, to see the supreme test of the aircraft carrier. Fate intervened that day, which was the day of the last big naval battle of the war, and the aircraft carrier did not take any part in it.

This interesting article will be concluded next month. In the next article the author will relate the part played by aircraft carriers in the Battle of Jutland.

A Pre-view of the New Corben Plane



This is the new Corben Super-Ace which is propelled by a Converted Ford "A" engine. Note the new Corben conversion.

THE monoplane shown above is the new Corben "Super-Ace" which is now undergoing flight tests in Madison, Wis. Further details will be published when these tests are completed.

The new ship is powered by a Corben converted Model "A" Ford engine which is described elsewhere in this issue. This ship can be produced very much more economically than a plane equipped with a standard aeronautical engine and uses ordinary automobile gasoline instead of the high-priced aviation gas.

The combination is the result of much study by Mr. Corben and his associates.

A New Slant on Aviation Laws

THE Air Commerce Act of 1926 does not in terms provide for a forfeiture of planes for violation of its rules. On the other hand, it does make certain penalties therefor a lien upon the offending craft, and, under the construction placed upón this provision by the courts, its enforcement in effect amounts to a forfeiture.

Obviously, the point here involved is of vital interest to aircraft owners, manufacturers, dealers, and others who in any way rely upon aircraft for the security of obligations. The application of this rule, and the reasoning upon which it is founded, is illustrated in a striking manner in United States vs. Batre, U. S. Circuit Court of Appeals, Ninth Circuit, 69 F. (2d) 673, which arose under the followirg facts:

Here one Scholey, as owner of a certain biplane, flew it from Mexico to Florence, Arizona, the latter not being designated by the Secretary of the Treasury as an airport of entry. It was not a forced landing, and a few days later the plane was seized by the inspectors of customs for violation of the Air Commerce Act, in respect to crossing the international boundary.

The government filed a libel *in rem* to collect the penalty against the plane, and one Batre intervened as the holder of a chattel mortgage upon the craft in the sum of $4,000. Batre thereupon prayed that the mortgage lien be adjudged superior to the lien for the penalty, setting up that he had no knowledge that the plane was being used in violation of the Air Commerce Act.

The lower court imposed the statutory penalty, declared it to constitute a lien upon the plane, and ordered the latter sold and the proceeds to be applied as follows: First, the costs of the proceedings; second, the payment of the mortgage; and third, the payment of the penalty assessed by the government. From this judgment the government appealed, and the higher court in reversing same reasoned, in part, as follows:

"If the penalty is incapable of enforcement, which is the result if the decision of the lower court is affirmed, then this provision affords no aid in preventing violation of the law. It can readily be seen that if a lien created by a chattel mortgage is held superior to this penalty lien those so disposed can always evade it by mortgaging the airplane up to or beyond its actual

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Two Pioneer Air Circuses

by CHARLES C. BARRENBRUGGE

Not many know it, but Doug Davis—recent air race victim—conducted an air circus right after the war at the time when barnstorming was at its height. And his chief competitor was a woman!

WE all remember November 11, 1918. The War was ended, the smoke began to clear away and Uncle Sam's doughboys were gathering up the spoils of the victory. Those famous dawn flights and night patrols had come to an end. The wings of our army had settled down to earth. Generals, majors, captains, and men of all ranks were joyful of the fact that they were returning home but most of them were confronted with this question, "What does peaceful Father Time hold in store for me?"

Among those giving this question much thought was Doug Davis, a second lieutenant in the Air Corps.

He began his career in aviation at Brooks and Kelly fields in Texas. He had a difficult time keeping up with his class from the very start. Time and again he was informed that selling fish would make him more money than flying airplanes but Doug had the nerve and courage to stick even though he was the goat of the outfit. He received his commission and later was transferred to France. After the war he returned to his home in Griffin, Georgia.

With his small savings, he purchased a clipped-wing Jenny and started barnstorming throughout the southeastern states, working off Chandler race track, located eight miles from Atlanta. He stationed himself here on week-ends and during the week made the surrounding towns. As people at this time were very pessimistic about aviation his earnings as a barnstormer were just enough to keep him in soda crackers.

Chandler race track is now the location of the third ranking airport in the United States, for operation. Doug Davis was the first man to operate off this field! Thus, he became one of the pioneers who strove for and aided the development of aviation.

Beller Blevins was his first competitor who brought in a ship and flew off the same field. Doug, because of his dynamic personality, became popular among the people of the surrounding countryside. As a result he made more money than Blevins and people in the adjoining towns began to beg for his appearance. Realizing the possibilities of aviation, Davis began buying planes and hiring pilots so he could meet the demands of his air-minded public. This was the beginning of the Doug Davis Flying Circus.

A few of the first to join the Davis circus were such men as George Sheally, a nationally-known racing pilot whose face is familiar around the national air races and other racing circles throughout the country. He soloed on Thursday and the following Saturday took two cross-country flights to hop passengers with the circus. Of course, there were no Department of Commerce regulations for such feats at that time. He now is a colonel on the Governor's staff in the state of Kentucky.

The inevitable end of an air-racer's career. The wreckage of Doug Davis' plane at the 1934 Cleveland races in which Davis was killed. Doug was much too fine a pilot to be sacrificed on the altar of commercial air races.

Johnny Kytle, who began his career at Brooks and Kelly fields, was known to be one of the best stunt pilots in the country. The latter part of his life was spent flying mail from Atlanta, Georgia, to Richmond, Virginia. He met a most spectacular death on February 15, 1931, while stunting a Gee-Bee at Atlanta, Georgia. With a wide open throttle he dove straight into the ground trying to come out of a spin. He was the nation's first ranking mail pilot.

Vivian Jones was a trapeze performer from the big tent and a product of the United States Army. Frank M. Ward, who provided the humor for the whole outfit, is now chief pilot for a flying school in Birmingham, Alabama. Paul Davis, who was a brother to Doug, was another member.

The Doug Davis Flying Circus began its conquest proper in the spring of 1924. With Atlanta, Georgia, as their base they began working small towns and buying more ships to meet the demand for their appearance. In late June, Doug nosed his small fleet of airplanes into Opalaca, Alabama, to put on one of the most exciting shows of his early career. This was their first organized performance and netted them the sum of $1,400.

Davis immediately awoke to the fact that such an organization would make him a nice sum of money. So as time went on he developed quite a complete show by adding more stunts and ships to his fleet and secured the best talent available to execute the acts. He believed in the theory, "Give the public something for their money and receive more cash in return."

The remainder of 1924 he spent building his circus up to the highest standard possible, with the best available equipment, pilots and stunt men.

It is well to know that during his progress because of perfect cooperation among his associates he acquired a perfectly functioning outfit.

In the early part of 1925 down in Birmingham, Alabama, there lived a charming young lady, whose daring stunts had the whole countryside for miles around talking of her dangerous feats. This sophisticated little girl of the South was none other than Mabel Cody.

She became associated with some local airmen who featured her in their barnstorming tours, doing wing walking, stunts on the landing-gear and parachute jumps. She was the only girl living at the time who dared to make a death-defying exchange from an automobile or speedboat to an airplane. Her feats were so successful that Mabel soon conceived the idea of forming a flying circus of her own and persuaded

many crack flyers to join her troupe. Among these famous characters were men such as:

Bonnie Rowe, who started his career painting smoke stacks and water tanks. He was a member of the U.S. signal corps, and learned to fly balloons during the War with the Navy, making his first parachute jump from a smoke bag. He originated more stunts than any other person living, such as tying one hand behind him and making plane to plane exchanges. Another favorite stunt of his was to hang by his toes on a trapeze bar swinging fifteen feet below the plane. At times when it was impossible for him to get his parachute out of hock he with the help of his comrades would steal bed sheets from a hotel where they were rooming and stay up all night sewing them together, so he could make a jump the next day. The United Press called him, "The man born without nerves."

Slim Culpepper, who received his wings from the U.S. Navy. Curly Burns, a keen business man, and a wonderful promoter. "The only one of his kind," was the term used by the press in describing his qualities. And Jimmy Crosscup.

Every person in this troupe was a true son of the sky but their equipment was none too good for such an adventure. Thus this crude though very compatible outfit started out on the road defying death on every flight to make a living. Because of the high-powered salesmanship of Curly Burns, Mabel Cody and her show soon became well known throughout the southeastern states.

In 1925 the acts and stunts that made up the performance of an air show were much more spectacular, and thrilling than those of today on account of the danger involved because of the crude equipment, although it was the best available at the time. Since then the Department of Commerce has put a ban on such performances.

A performance at that time consisted of the whole fleet of planes flying low over the city where the show was to take place. They would stunt, dive and zoom down into the main street, around the court house and then fly off toward the field from which they were operating. This was repeated two or three times during the early part of the day to attract the populace out to the field.

As the crowd gathered on the field the pilots and performers were usually introduced as Lieutenants or Majors. All aviation enthusiasts fell for that type of ballyhoo because most people admire men of rank. After these so-made heroes were introduced, they would take-off one at a time and put on a solo stunting exhibition to work up the enthusiasm of the crowd. One man was always featured or starred by doing more stunts than the others so as to be idolized by the crowd!

Thus, they would want to ride with him and as a result he would be the

(Concluded on page 395)

Memories of the Gates Flying Circus

by BILL RHODE

A reply to a Kontact Kolumn advertisement sent in by a former member of the circus. The Gates Circus was the greatest of its day.

I CAME across your advertisement in the Kontact Klub, requesting information on the former Gates Flying Circus and Aviation Company. I, myself, was not a flying member of this band, for the best connection I had with them was as a greaseball before it broke up. I am an historian of it, however, and have piled up quite a bit of information concerning it.

Ivan R. Gates, who with Clyde E. Pangborn owned the circus, started as a promoter in 1911, booking exhibitions for Didier Masson, Art Smith, and Fred Hoover up to the beginning of the War. Gates could always get the necessary publicity and that's what built up the circus. Gates committed suicide in New York a year or so ago.

After the War, Gates met Pangborn, an ex-army pilot and the first of the gypsy flyers. About 1922, Pangborn

The tremendous power-plants of today's racers and stunt ships make stunting relatively safe and easy.

and Lowell Yerrex banded together and hired Gates as a publicity man and promoter. Later, Gates and Pangborn organized the circus with Jenkins as their first stuntman.

Jenkin's 'chute failed to open, with the usual results, and Wesley May succeeded him. May's 'chute also failed soon after and appropriately landed him on a tombstone. May was originally connected with the Hollywood movie squadron and instituted many original stunts. He was the first man to perform a refueling flight by making a plane change with a five-gallon can of gasoline strapped on his back.

May was also the first man to roller skate off the top wing. He also attempted to ride a bicycle on the top wing after the wing had been stripped with beaver board. Freddie Lund and Milton Girten succeeded May as wingwalkers. Pangborn was the first to make a change from an automobile to an airplane and nearly lost his life doing it.

At one time in 1927, the Gates Flying Circus had thirteen planes on the apron at the Teterboro, N. J., airport, and was credited with carrying one million passengers before the circus broke up. This circus was the originator of the dollar ride. It was Bill Brooks who broke all records by flying 980 passengers in one day (1928) at Steubenville, Ohio.

The circus held a contract with the Texas Oil Company for six years, the Texas company supplying them with gasoline and oil in exchange for carrying the Texas Star trade-mark on the wings of the planes. The gaily decorated planes were five-place Standards with Hispano-Suisso engines, each plane having a steel ladder on the side.

Gates paid his pilots anywhere from $400 to $1,500 per month and this is one of the reasons why he got the best of the pilots. Some persons have said that the Gates Circus turned out more famous pilots than the Army and Navy together, but while this is an exaggeration in a sense, it is nearer true than many of my readers probably believe.

Duke Krantz was the originator of the "standing loop." He would stand on the top wing while the pilot looped the ship—and this was something. Jack Ashcraft, in 1926, stunted with three others for 45 minutes with a broken arm in order to fulfill a $3,000 contract. It was Harold McMahon who set his Standard down into the Hudson River and Al McClatchie who floated to shore with a spare tire that the ship carried. There were plenty of accidents and narrow escapes from time to time.

One time, the movie actress, Rosalie Gordon, was to make a 'chute jump from Pangborn's ship with an old pull-out 'chute. Her weight, however, succeeded only in pulling the shrouds out of the container, the 'chute canopy being stuck in the container that was tied to the landing-gear. She dangled under the ship and Girten, flying with them, dropped down on the landing-gear but could not pull her out or up on account of the wind.

Then, Freddie Lund made a plane change, and being a small man, neither he nor Girten together could pull her up. The rope that held her was greasy and oil stained. Finally, Lund slipped into the cockpit just as Pang slipped out and Pang and Girten together finally pulled her out. The news of this rescue went from coast to coast.

Pangborn could fly a Jenny on its back for two miles, which is a record by itself. He was so adept at this trick that he had his name printed on the top wing. The story of this upside-down performance was printed in a recent issue of POPULAR AVIATION.

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High-Lights and Side-Lights

by STEVE O'CONNOR

Here and there among the great and near great in aviation. A chit-chat on current events and happenings in the industry.

THERE are seven pilots flying the stars and stripes for your Uncle Sam's Navy who are over fifty years of age. Who said flying was a young man's game? And if you have pictured to yourself an average young man as the ideal flying person there are 13 pilots in the Navy who weigh over 200 pounds. And, furthermore, there are just 39 giants of the wing who weigh between 190 and 200 pounds. Now don't ask me if they have to build special cockpits for these heavy men of the air any more than they would have to for the two Navy pilots who weigh less than 120 pounds.

Steve O'Connor

The Navy has its youth to carry on. There are 20 pilots between the ages of 20 and 25.

Ever since the early days of the World War, when the practical uses of aviation were studied from a military viewpoint, there has been a continuous battle of blueprints on design and between weight and performance. One of the outstanding results of the weight reduction battle of Navy aviation is the development of the modern and efficient air-cooled radial aircraft engine.

Continuing with its weight reduction investigation, the Navy finally came to this question: *Would it be possible to form a squadron or squadrons manned by pilots whose weights were within the range of approximately 115 to 125 pounds?*

The Bureau of Aeronautics of the Navy went to the Bureau of Medicine and Surgery and an analysis of medical records of about eight hundred officer pilots was started. It was learned that "jockey squadrons" were not feasible since only a small number of pilots were within the desired weight range. Just half of one percent were of less than 125 pounds and only 1.5 percent were over 200 pounds in weight.

It was learned that 85 percent of Naval pilots weighed in at 130 to 180 pounds. From the records it was soon learned that the pilots were an unusually uniform group of healthy men. It was also soon proved that the old theory of the only good aviator was a young man who possessed youth and had the daring to "do or die" in order to fulfill his orders. In the late war most of the aviation squadrons were filled with young boys. But today the military forces and the ranks of commercial aeronautics are filled with men of "seasoned judgment" and "ripe experience."

The records indicate that in no other field does there exist a more rigorous demand for the maximum coordination of physical and mental attainments than in that of aviation.

Herb Shearer, popular head of the Kendall Refining Company, has reluctantly said goodbye to all his business associates and his employes and will soon be resting in California where the croakers have advised him to go for his ticker . . . It has been a good big heart and one that was wrapped up in aeronautics . . . Many happy days to you, Herb, and here's success to T. O. Grisell, who is stepping in. "Doc" Kincade tells me Grisell is an ex-newspaper man—which is okeh.

Harold Neumann has bought Benny Howard's racing ship, "Ike," and is really flying the job. His stunting of "Ike" was one of the highlights of the Chicago Carnival of the Air which was managed by Leo Sauerborn of Milwaukee. He was also managing the endurance flight of Jean La Rene which was started and postponed many times . . . Miss La Rene will try again . . . Red Smalling, who has flown several Condors on pontoons down to South America, tells me that Mr. Faucett, who flies mail and so forth for the Peru government, was married this summer. Which reminds me to write to Walter Brooke who is flying for him. Red Williams has been down there for quite a spell now.

Paul Ryan, who is advertising manager of the Shell Petroleum Co. at Cleveland, gave air racing and the Henderson Brothers a great send-off and said that his organization would back the Hendersons any time a big race meet was on . . . Just recently Jimmy Doolittle, popular head of the Shell's aviation department, was quoted in the daily press as rapping air racing. Jimmy, Paul, and the Hendersons are all good friends. Was Doolittle misquoted? When entered in competition Doolittle was a consistent winner. I know he was distressed by the loss of his friend, Doug Davis, who was popular with everyone.

Did the senate investigating committee at Washington know that Hans Siburg of the German Air Ministry just recently completed a tour of United States aircraft factories, airports and government air-bases? While over here he stated that the two Boeing transports which were delivered earlier this year are in regular passenger service on the Luft Hansa Amsterdam run. Coincident with the investigation a third Boeing transport was announced by that company for a German airline.

A shipment of a Model 28, single-seater, all-metal, Wasp-powered fighter to China as a demonstrator was made by Boeing. The plane is similar to the P-26A planes built by the company for the Army Air Corps. J. P. Murray, vice president and eastern representative of the Boeing Company, recently spent a month at the Boeing plant.

I am informed that there may be State Department difficulties regarding the grounded and undelivered planes on which certain South American governments have paid very substantial down payments. Aircraft companies won't make any refunds. Our government will not allow the planes to leave the U.S. because of the belief they are for use in war.

748 airplanes were manufactured in the United States during the first half of 1934. 374 of these airplanes were for domestic civil use, 264 for military delivery and 110 for export. Few enough airplanes for export without hindering that business. Of the 374 planes built for domestic use 273 were monoplanes and 101 biplanes.

Get a load of this—I think it's interesting. Parts of Richard Haliburton's Stearman are flying in many parts of the world. The famous ship, known as the "Magic Carpet," carried Haliburton and Moye Stephens across many lands and was shipped over much water. It finally ended up in the hands of a west-coast used plane dealer. The plane was sold to a couple of naval officers in Honolulu. Due to faulty installation of its controls during re-assembly it cracked up and was returned to the used plane dealer. Instead of rebuilding the plane it was decided to sell the parts—and strange enough, these parts are being sold in many far-away places.

One wing was sold for replacement for a plane flown in Honduras in carrying gold out of the country. It took five days by ox cart and almost a week by man power to get the wing to the stalled plane in the interior. The "Magic Carpet's" tail-assembly was shipped to Fairbanks, Alaska, for a plane doing charter work. The explorer, MacMillan, is using the wheels on his Lockheed Vega which has seen service in the far north. The motor is pulling a Stinson in daily service in Arizona. The landing-gear struts are now on a private plane up in Washington. The control cables and fittings are in a lightplane and heaven only knows where it is. The instruments have been sold to many parties all over the continent. The "Magic Carpet" is flying on.

Pilots on the regular scheduled air-

lines will have to be examined by a Federal physician every three months. The pilot can fly only a thousand hours per year or an average of 83 hours per month. He may fly 100 hours per month, but not for more than four consecutive months. The old regulations allowed 110 hours per month.

Mrs. Franklin D. Roosevelt has been invited by Secretary of the Navy Swanson to sponsor the new Navy aircraft carrier CV-6, to be named the U.S.S. Enterprise, now under construction by the Newport News Shipbuilding and Dry Dock Company, Newport News, Virginia. The ceremonies will take place some time in February as the ship is to be completed early that month. The Enterprise, of 20,000 tons displacement, is being built under terms of the London Naval Treaty of 1930. This will be the sixth government vessel to carry the name Enterprise.

The Noel Davis trophy has been awarded to VN Squadron 6-R stationed at Anacostia, D. C. The trophy is awarded each year to the Fleet Reserve Aviation Division receiving the highest efficiency merit, as determined by the Naval Research Inspection Board.

Eastern Air Lines are spending close to a million dollars in expanding their lines. New equipment will get most of the money. The line has increased its daily mileage from ten thousand to fifteen thousand miles. What did Lockheed officials say to the announcement

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KONTACT KLUB KOLUMN

THIS is the bulletin board of the aviation world by which you are invited to contact your friends. This service is free to all of our readers and we trust that the column will expand and render a long-desired service.

JOHN STILES, formerly of Dixon, Ill., an attendant at the Walgreen airport. I would like to get into communication with you and get your slant on the lubricating oil reclaimer that we talked about last summer.—AL WALKER, 7751 Troupe Ave., Denver, Colo.

H.H.H. Here's your call. My answer is yes.—K.L.B., Boston, Mass.

"LEFTY" NELSON. Last heard from at the Harlem Airport, Chicago. Anyone knowing his address please write to me.—HOLLIS SANDERS, U.S.N.T.S.-88-B, Norfolk, Va.

PLEASE COMMUNICATE WITH ME. I have something of importance for each of the following men:
HARRY N. ATWOOD (Model B Wright Pilot)
WALTER BROOKINS (Model B Wright Pilot)
TONY JANUS (Benoist Pilot)
WELDON COOKE, formerly of Sandusky, Ohio.
EARL V. FRITTS, formerly with Thomas Brothers, Bath, N. Y.
Please answer me as soon as possible.—ROY C. BURR, Carrier No. 10, San Pedro, Calif.

CAPT. JERALDO E. CLARKESO. With Italian N.A.F. in 1929. Have a deal with 'C" under way. Am awaiting word from you. Please wire your address.—CAPT. GORDON VAN RIPER, 3418 Gillam Road, Kansas City, Mo.

CAPT. CLYDE T. HARRISON, Ex-Marine Corps Pilot. What are you doing and where are you now located? Please drop me a line. I would like to see you again, even if you are in Chicago. Remember me?—JESSE DAVIDSON, 1075 Longfellow Ave., New York City.

J. GERTLER, Bronx, N. Y. Ben Howard, I believe, is an airmail pilot. Why not contact all airmail operators? Dept. of Commerce might have his home address. Hope you find him.—JESSE DAVIDSON, 1075 Longfellow Ave., Bronx, N. Y.

AVIATION FAN. I desire to get in touch with someone interested in aviation, between 17 and 20 years old. This person can be a pilot, mechanic or just a plain layman so long as he is interested in the subject. Either a boy or girl.—HAROLD HOFMASTER, R.F.D. No. 3, Great Bend, Kansas.

PLANE WANTED. I wish to purchase a Travel Air in good condition, either licensed or eligible for a license. Give full particulars in first letter and, if possible, enclose a snap-shot. The plane should preferably be located near New York City.—J. W. M., care of POPULAR AVIATION, 608 S. Dearborn St., Chicago, Ill.

GIL SHELTON. When last heard from was flying at Hollywood, Calif. Any information as to his present whereabouts and address will be greatly appreciated.—HOLLIS SANDERS, U.S. N.T.S.-88-B, Norfolk, Va.

JOHN STOVER. When last heard from was flying from Hot Springs, Ark., airport. Anyone knowing his present address please get in touch with me.—HOLLIS SANDERS, U.S.N.T.S.-88-B, Norfolk, Va.

HARRY KALM. Please tell me how to get the address of Paul Chamberlain, formerly at Roosevelt Field. I am the guy that cracked the Fairchild last summer and paid for the recovering job.— BROWN, 4747 Sumner Ave., Boston, Mass.

HOWIE WOLF, formerly of Galesburg, Ill. I have received some letters for you from J.C.C. Please send your address and about 15 cents in stamps.- -FRANK ENGLEBRETZEN, Gypsy Airport No. 1, Tampa, Fla.

HEXY, one-time pilot of a Jenny. Once a mechanic with United. Please write and tell me where you are and what your plans are for the future.—COLEMAN J. ARTHUR, 341 Eagle St., Brooklyn, N. Y.

GLOSSARY OF WORDS, TERMS AND PHRASES—DIC-A-33

Aviateur. (French.) See AVIATOR.

Aviation. The art or act of flying with an airplane or other heavier-than-air machine. Flying lighter-than-air craft, such as balloons or airships, is AEROSTATION.

Avigation. The navigation of aircraft or aerial navigation.

Aviator. One who flies a heavier-than-air machine, such as an airplane. The PILOT of an airplane.

Avigational Stars. The stars, or heavenly bodies, used in locating the position of aircraft. Of the most importance is Polaris, the "Pole Star," that is always within three degrees of true north.

Avigraph. An instrument used in AVIGATION for computing the course and time in making a flight.

Avion. (French.) A warplane as distinguished from private or commercial aircraft.

Avogadro's Hypothesis. See AVOGADRO'S LAW.

Avogadro's Law. This law states that, under equal pressures and temperatures, equal volumes of all gases contain the same number of molecules. At a pressure of 1,000,000 dynes and an absolute temperature of 273° C., a cubic centimeter of a gas contains 27 billion-billion molecules.

Avoirdupois. An American and English system of weights in which a pound is equal to 16 ounces, a short-ton is 2,000 pounds, and a long-ton is 2,240 pounds.

AX. Abbreviation for AXIS.

Axe Moteur. (French.) Engine shaft.

Axes. Plural of AXIS.

Axial. Along the axis.

Axial Flow. Flow of a liquid or gas along or parallel to the axis or shaft of a machine.

Axial Load. A load or pressure acting along the axis or shaft of a machine. Sometimes known as "end-thrust" or "end-load."

Axial Movement. Movement along the axis or the end movement of a shaft.

Axis. A reference line, passing through the center of a body or through the center of some rotating part. The line about which rotation or oscillation takes place.

GLOSSARY OF WORDS, TERMS AND PHRASES—DIC-A-34

Axis-A. The vertical scale of measurement in a graphical chart. Sometimes called the "axis of ordinates" or the "ordinate."

Axis-B. The horizontal scale of measurement in a graphical chart. Sometimes known as the "Abcissa" or the "horizontal axis."

Axis of Airplane. The line about which an airplane turns, rolls or yaws. There are three principal axes of movement in an airplane. The axis of roll (about longitudinal axis), axis of yaw (about vertical axis), and the axis of pitch (horizontal axis through wings).

Axis of Inertia. An axis about which the moment of inertia is at a maximum.

Axis of Rotation. The axis around which a body turns or rotates. In this case, the centerline of a rotating shaft will be the axis of rotation.

Axis of Symmetry. The line or axis around which all parts of a body are similar and equal. Thus, the centerline of a cylinder is also the axis of symmetry.

Axis of Thrust. The prolonged centerline running through the center of the propeller, or the line along which the propeller thrust acts in propelling aircraft.

Axis-X. A horizontal axis passing through the fuselage or in the direction of flight. The ship "rolls" sidewise about this axis.

Axis-Y. A horizontal axis passing through the center of gravity about which the ship pitches, nose-up or nose-down.

Axis-Z. A vertical axis through the center of gravity about which the ship "yaws" from right to left.

Axle. A shaft or bar upon which wheels are mounted, the wheels generally turning freely on the shaft.

Axle (Divided). A type of axle used on airplane landing-gears which is pivoted at the center so that the two ends carrying the wheel are free to move up and down.

Axle (Solid). An undivided continuous axle.

Azimuth. The bearing or direction of a body, point or line as determined in avigation.

B. Chemical symbol for BORON.

Ba. Chemical symbol for BARIUM.

What About Wing Flutter?

by J. D. VAN VLIET

In this article, a prominent engineer carefully takes up the many causes that enter into wing flutter. This condition can be avoided by taking the proper precautions in the design and construction of a wing.

THE term "wing flutter" is applied to the vibrations produced in a wing by the combined action of the aerodynamic impulses impinging on its surface, and the natural frequency of vibration of the wing structure; under certain conditions these vibrations may become so pronounced as to cause the fracturing of the main members of the wing frame.

This phenomenon is usually associated with cantilever wings, yet it may also occur in the freely overhanging portions of externally braced wings or wing cells.

By reason of its spontaneous nature and the serious accidents which it has caused, wing flutter has come in for a good deal of investigation; the data thus made available however is often of too theoretical a nature to allow of its direct application unless the designer goes to the trouble of digging out such salient facts that will readily lend themselves to practical interpretation.

The wide scope of the subject does not permit its being done full justice to in a few paragraphs; this article will therefore be confined to a cursory discussion of some interesting tests conducted by the Material Division of the Air Corps.

The model used in these tests was of Clark-Y section, 42″ span by 7″ chord, aspect ratio 6.

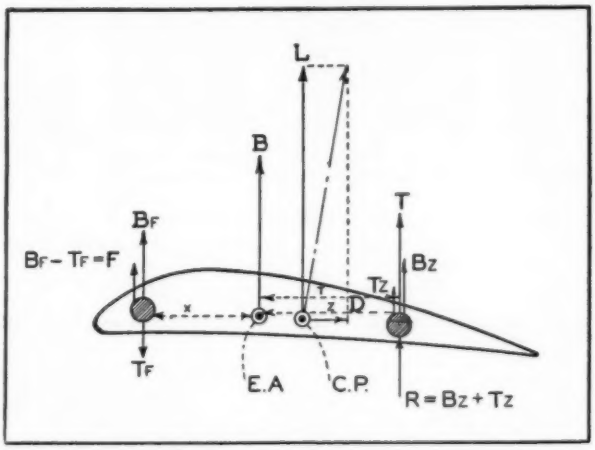
A cantilever wing, by virtue of the airload it carries, is subject to flexure in a lateral sense. In many designs a wing of this type is also prone to helicoidal twisting about its elastic axis. The eddying and undulating action of the wind-stream will cause fluctuations in the airload, which in some instances may be only of occasional occurrence, while in other instances these fluctuations may be of sustained periodic sequence and thus cause a rhythmic increase and decrease of the airload, entailing correspondingly timed modifications in the torsional and bending deformations of the wing.

It is obvious that a sudden decrease in the airload will allow the wing to partially, and in some extreme cases even wholly, resume its normal conformation, this non-flexed condition being attained through a series of oscillations caused by its inherent resilience, which gradually diminish in amplitude on account of internal friction and air resistance.

Vibrations are always present in a wing of any description, in most cases however their amplitude is so small as to render their effect on the molecular structure of the wing's component members practically negligible.

The tests brought out that *the frequency of wing flutter was always the same as the natural frequency of the torsional oscillations of the airfoil.*

On the model this frequency, measured by stroboscope, was found to be 400 complete cycles per minute, a rather high value which may be ascribed to the considerable resilience of the steel spars and steel drag-bracing members of the wing frame.



A diagram illustrating the forces that act upon an airplane wing and which contribute to flutter.

At first flush it would seem plausible to assume that the natural frequency of vibration in torsion would be effected to an appreciable extent by the much lower natural frequency in bending. The tests showed that such was not the case; the bending oscillations, in fact, appeared to depend entirely on the torsional oscillations. The following simple analysis will explain this seemingly illogical behavior of the airfoil.

The frame consisted of two solid steel spars which were rigidly interconnected by steel drag-braces, an arrangement which imparted a high degree of resilience and rigidity to the wing. The center of aerodynamic effort was situated well back of the elastic axis of the airfoil, as shown in Figure 1.

Following the method advocated in N.A.C.A. report No. 329, the lift force L can be resolved into two parallel forces, B and T, of which B passes through the elastic axes E-A, and T is applied to the rear spar. The bending of the airfoil then is determined by the force B, which resolves into the forces Bf on the front spar and Br on the rear spar, imparting the same deflection to both spars.

The force T multiplied by its lever arm t to the elastic axis gives the torsional moment that causes the twisting of the wing. This torsional moment may in its turn be resolved into the moments Tf × f for the front spar, and Tr × r for the rear spar.

The forces Bf and Br are termed the *bending loads*, while the forces Tf and Tr are designated as torsional loads; Bf, Br, and Tr act upward, and Tf acts downward. The total load on each spar then is equal to the algebraic sum of the bending load and the torsional load; Tr + Br thus being the total load on the rear spar, and Bf — Tf the total load on the front spar. The twisting of the wing then is the result of the difference in the bending deflections of the two spars. It is evident that the natural frequency in torsion then is the same as the natural frequency in bending, since both frequencies are produced by fluctuations in the same bending loads.

When the frequency of these fluctuations is the same as, or a function of, the natural frequency in torsion, the amplitude of the oscillations is augmented and flutter is the result.

The above explanation holds good for torsional oscillations of very small amplitude, such as would occur in a wing frame of great rigidity, whereby actual torsion in the wing spars is virtually excluded.

Another important point brought out by the tests was that *if the natural frequency in torsion was made approximately the same as the natural frequency in bending,* excessively large *and violent oscillations were produced.*

The torsional frequency of the airfoil was modified by attaching a forwardly extending strip of wood to the tip parallel to the airstream, this strip being weighed down at the end by lumps of wax, until the torsional frequency corresponded to the frequency in bending. The loaded strip, acting as a lever, had the effect of greatly increasing the mass-inertia of the

wing, and imposed besides an initial downward acting load on the front spar and an upward acting force on the rear spar. These loads in combination with the torsional and bending loads due to the airload produced a condition of precarious statical balance, the resultant load on the front spar being probably zero, or even negative, while the resultant load on the rear spar was disproportionately increased.

The lever-arrangement above described was resorted to merely as an expedient; similar statistical conditions could be produced by modifying the sectional movements of inertia and the spacing of the wing spars in such a way as to shift the elastic axis forward so that the center of effort would then lie midway between the elastic axis and the rear spar. The forces B and T would then be equal and the component twisting load Tf would then completely counteract the bending load Bf.

This would render the airfoil torsionally unstable and susceptible to the slightest fluctuations of the airload. In this case then flutter would be apt to start at a very low airspeed and the resulting oscillations would be of low frequency and of large amplitude. The ample oscillations would moreover cause the center of effort to shift back and forth whereby an additional rhythmic modification in the loads on the spars would be produced in frequency corresponding to the aerodynamic impulses or a function thereof. To make matters still worse the large angles of torsion in the wing frame would produce secondary bending stresses as well as torsional stresses in the wing spars in addition to fluctuating tensional stresses in the drag-braces.

A flutter of this description, largely attended by resonance, once started, would be practically impossible to stop.

In order to minimize the possibility of flutter in a wing, it is advisable to distribute the mass in such a way as to make the wing torsionally as stable as possible. This does not necessarily imply rigidity for an ideal condition would be obtained if the elastic axis, the gravity axis, and the center of effort were all made to coincide in which case any twisting of the wing would be excluded so that the natural frequency in bending would then be the criterion.

It might be possible by compromising on the strength requirements of the spars, to make the elastic axis and the gravity axis coincide; the center of effort however would shift in accordance with the angle of attack, so that vibration, if not flutter, would still manifest itself at different airspeeds. The best compromise is to keep the center of effort back of, but as close to, the elastic axis as possible, and to keep the center of mass well back of the center of effort, for a wing which tends to twist down at the trailing edge by its own weight will have less tendency to flutter than one in which the gravity axis is situated forward of the elastic axis.

It would also be advisable to keep the natural frequency in bending well below the natural frequency in torsion. Several methods have been evolved to determine the natural frequency of a wing in torsion, either by computation or by experiment, all of which are rather cumbersome; if the designer, however, wishes to get a preliminary approximate *comparison* of the torsional and bending frequencies, he could consider the wing as a leaf-spring laterally and as a composite girder torsionally and could then figure the bending deflection and the torsional deflection separately for an assumed point load and for a twisting moment at the tip. From these deflections he could get the time in seconds for a complete vibration in each case, figured exactly as for a spring, the reciprocal of which values would give him the frequencies.

There are, of course, many factors entering into the problem, not the least of which is the interferences in torsion and bending by the inter-spar strut-points for a distributed load; the frequencies obtained will therefore not be the actual frequencies.

They will, however, give him a fairly accurate idea of their *proportionate relation.* If the torsional frequency comes too close to the bending frequency the design will have to be revised

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GLOSSARY OF WORDS, TERMS AND PHRASES—DIC-A-35

Babbitt (Metal). A bearing metal for lining bearings, a so-called "anti-friction metal" having a low coefficient of friction and soft enough to prevent cutting a revolving shaft. The babbitt metals belong to the "tin-base" series.

Babbitt (S.A.E.). A special babbitt for automotive service devised by the Society of Automotive Engineers. It consists of 84 parts of tin, 7 parts of copper, and 9 parts of antimony.

Backbone. The main longitudinal member of a structure. A structural member connecting a series of gas or air cells.

Backfire. Explosions in the exhaust-pipe or muffler of a gasoline engine due to defects in the ignition system, valves, carbureters or other parts of the engine.

Back-plate. A motor mount for a rotary cylinder engine. Attached to the fuselage.

Backpressure. Pressure acting against the operation of a device or system. More commonly, the pressure at the exhaust of an engine due to friction.

Backwash. The backward currents due to the action of a propeller. See SLIPSTREAM.

Baffle. A plate or diaphragm employed for directing the flow of a fluid. A guiding passage for a fluid.

Baffle (Hot). A plate or surface, highly heated, for completing the vaporization of liquid fuels.

Bag. (1) A nickname for the envelope or gas enclosure of a balloon or airship. The gas-containing cell. (2) A loose flabby fabric covering that forms pockets or "sags."

Bail-out. To make a parachute jump from an aircraft.

Bakelite. A substance obtained from the phenol-resins. Employed as an insulator or for molded parts on ignition systems, radios, etc. It can be obtained in tubes, sheets and rods.

Balance. (1) To place in a state of equilibrium, a condition in which all forces and weights are neutralized. (2) A device for weighing objects ("scales") in which the weight of a given object is balanced by a known weight.

Balance (Counter-). A weight employed for balancing or neutralizing another weight or a force.

GLOSSARY OF WORDS, TERMS AND PHRASES—DIC-A-36

Balance (Dynamic). A rotating body in a condition wherein all rotational forces are balanced within themselves so that no vibration is produced while the body is in motion.

Balance (Explosion). A condition in which the impulse forces due to the cylinder combustions are balanced to avoid vibration.

Balance (Running). See BALANCE (DYNAMIC).

Balance (Static). Balanced when at rest. A statically balanced body will stand in equilibrium in any position but it is not necessarily balanced when in motion.

Balanced Ailerons. Aileron surfaces balanced against air-pressure by auxiliary flaps or other counter-balance systems.

Balanced Area. An air loaded surface (control surface) in which the load is balanced by an auxiliary surface or force.

Ball-bearings. A type of bearing in which steel balls are placed between moving surfaces to introduce rolling action instead of rubbing. The friction is reduced materially. The ANNULAR type of ball-bearing takes the loads perpendicular to the shaft. The THRUST bearing takes end-loads or prevents end movement of the shaft.

Ball-cock. See BALL-VALVE.

Ball-inclinometer. An instrument designed for determining the angle of pitch or roll of an aircraft. It consists of a ball rolling within a glass tube bent to a circular arc. Rapid and irregular movements of the ball are checked by filling the tube with fluid.

Ball-valve. A valve in which the seating or unseating of a metal ball closes or opens a channel to the passage of a fluid.

Ballast. (1) An adjustable weight used for balancing. (2) An adjustable resistance used for balancing an electrical circuit.

Ballast (Balloon-). A heavy easily disposable and adjustable load for regulating the altitude, ascent, and descent of a balloon or airship. Sand, lead-dust, and water are used for this purpose. Throwing out ballast reduces the weight of the balloon so that it ascends until the lift and the weight are again equal in the upper and lighter atmosphere.

Sound-proofing in Practice

by ALEXANDER KLEMIN

A discussion of the construction of airplane parts and materials employed in reducing noise in an airplane.

AN English writer, Dr. A. H. Davis, has analyzed the noise-levels of a number of British airplanes and as a result has given some practical "common sense" rules in regard to location of the power plant and exhaust.

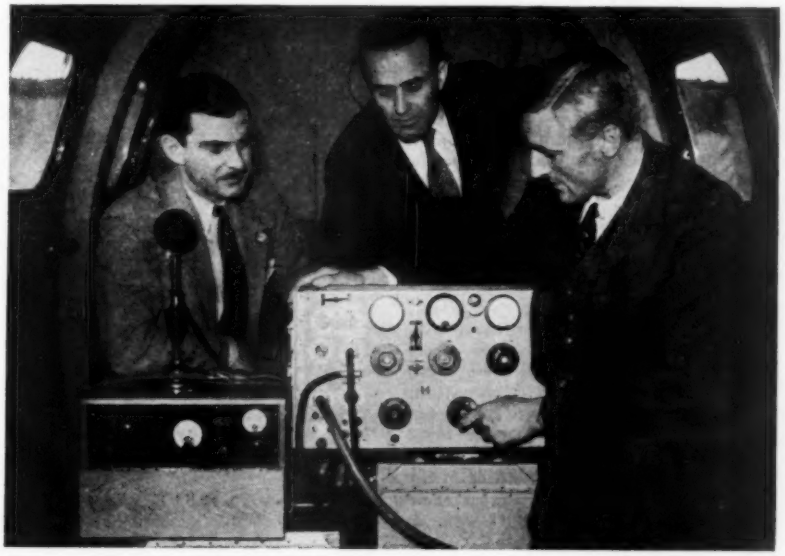
1. Airscrews of high tip-speed should *not* be placed so that their tips are close to the passenger compartment.

2. If, in a twin-engined or three-engined airplane, considerations of balance and other design considerations force the location of the airscrew tips to the proximity of the fuselage, then the baggage compartment or the lavatory should be located in the plane of the airscrew.

3. The location of engine with exhaust and cabin between the wings of a biplane is particularly bad, because the noise is then trapped between the wings. But, whether in the case of a biplane or a monoplane, the sources of noise should, if possible, be screened from the cabin by the interposition of a wing.

4. Long exhausts discharging well behind the cabin are a useful precaution.

The above rules hardly need discussion and can readily be followed in most designs.



Engineers making a decibel test in a V-1 plane built by the Airplane Development Corporation. At the left is Carl J. Spain, superintendent of Electrical Research Products, Inc.

CABIN WINDOWS

ARCHITECTS and modern airplane designers are now both agreed that it is desirable to dispense with the dual functions of admitting light and air and to restrict windows for the transmission of light with ventilation secured by other means in which noise admission is under better control.

If windows are used solely for lighting, considerable care must be exercised if their noise insulation is to be equal to that of the cabin walls, and the following rules should be carefully followed:

1. It is necessary to use thick glass, about 3/16" or 1/4" thick, for the windows, if their insulation is to be equal to that of the walls.

2. The weight of glass windows is considerable, so that window dimensions should be as small as consistent with good vision.

3. Windows should be "floating" or "vibration" mounted by the use of a rubber mounting, which, however, must be carefully designed. The mounting shown in Fig. 1 is thoroughly bad, it makes a drum of the windows. The type shown in Fig. 2 is excellent. In this design the glass can be displaced a quarter of an inch in either direction. The pieces on the sides are mainly for appearance, but they also prevent the pane from being pushed out completely.

4. The glass should be powerful in "transmission-absorption" for a given weight in lb./sq. ft.

5. Glass may be powerful in "transmission-absorption," yet transmit sound by vibrating as a diaphragm. Therefore, it should have a high vibration-damping coefficient. It will then have less tendency to "sing." Fortunately, some good new glasses are now available. The following is a typical specification:

Thickness, approximately 1/8"; *transparency, good; weight,* 30 *ounces per square foot; damping coefficient,* 0.187; *transmission loss,* 31 *decibels at* 400-512 *cycles,* 32 *decibels at* 1,000-1,500 *cycles; impact strength high as illustrated by dropping a steel ball and noting*

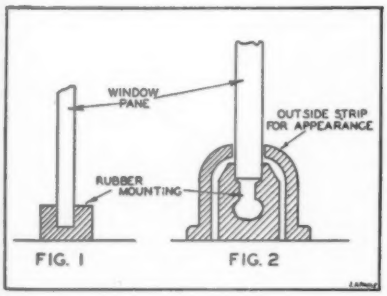
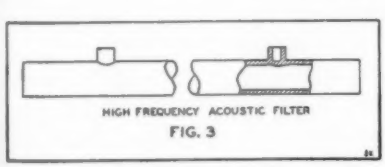
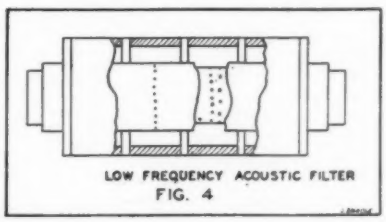


FIG. 1 FIG. 2



HIGH FREQUENCY ACOUSTIC FILTER
FIG. 3



LOW FREQUENCY ACOUSTIC FILTER
FIG. 4

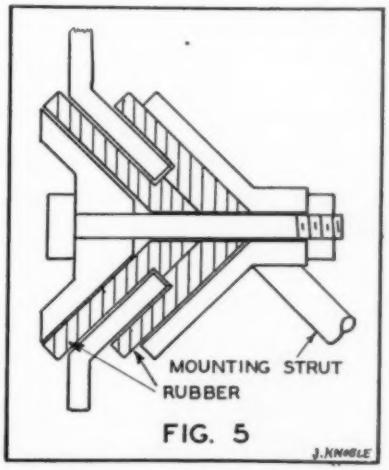


FIG. 5

that radiating cracks from point of fracture are almost eliminated.

6. Double windows with an intervening air space are to be avoided. The air between the panes transmits the sound pressure from one pane to the other, so that there is very little reduction in sound transmission while the weight becomes considerably greater—besides a small hole or crack is necessary to keep the panes from fogging.

VENTILATION

THE inlet of the ventilating system should be placed where it is believed that the sound intensity is at a minimum. The best location is in the very nose of the fuselage for a twin-engine machine. If ventilation inlets are placed at the leading edge of the wing, they should not be within the slipstream.

A good precaution is the use of a sound-filter in both the inlet-pipe and the outlet-pipe of the ventilating system. The principles of sound filters are not unlike the principles employed in electrical work where combinations of inductances and capacitances are used to allow certain frequencies to be transmitted and others to be eliminated.

The subject of filter design calls for a voluminous paper in itself. Just to give an inkling of the subject there is shown in Fig. 3 a high-pass filter which allows sounds of over 700 cycles per second to pass through and suppresses lower pitch sounds. It consists merely of a number of pipe sections with orifices open to the atmosphere placed at intervals along the pipe.

In Fig. 4, is shown a low frequency filter in which the pipe is enclosed in an outer pipe with chambers formed by partitions and small holes placed in the inner pipe. In skillful hands the theory of filter design can be employed to give filters of almost any required characteristics.

Filters can be designed whose characteristics can be readily adjusted by simple mechanical means.

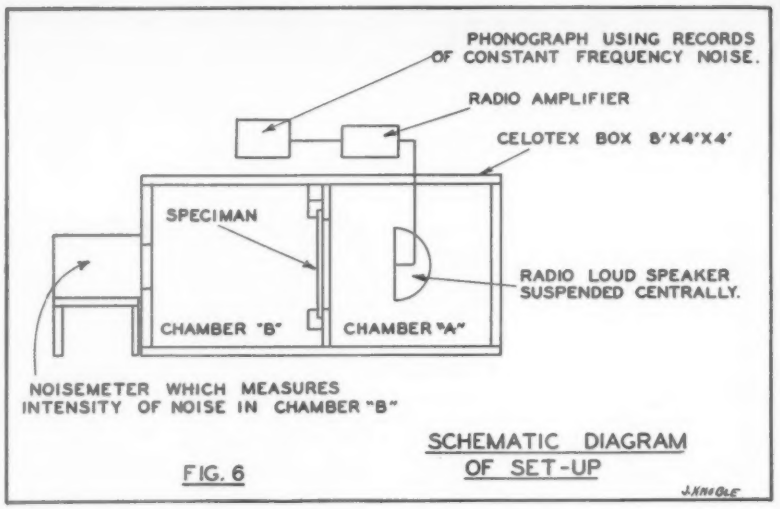


FIG. 6 SCHEMATIC DIAGRAM OF SET-UP

J.KNIGHT

STRUCTURAL RECOMMENDATIONS

DRUMMING of a fabric covered fuselage, particularly when placed near propeller tips, is very difficult to stop. A monocoque metal fuselage is much easier to handle. Even with a monocoque metal fuselage, considerable attention must be paid to the avoidance of drumming. Pads of some material like felt or sterilized hair disposed at intervals will protect the skin against such effects.

The engine and propeller have frequencies of vibration which may be transmitted to the structure and hence to the cabin. A single-engined machine with the engine in the nose is more troublesome in this respect. To reduce these frequencies, as much as possible, a flexible rubber mount is required.

Theoretically, the flexible mount should eliminate not only the vibrations induced by variations in torque, but also the longitudinal vibrations induced by variations in thrust of the propeller blades when passing in front of the fuselage or the leading edge of the wing.

A sketch of a possible mounting is shown in Fig. 5. This is only theoretically desirable, however; a mounting which takes out the longitudinal vibrations is apt to be too flexible and the best opinion is that only the torsional or torque vibrations should be eliminated.

Even if the cabin is provided with sound-proofing panels, it is highly desirable that it be made to "float." The cabin should be constructed of a light inner framing of wood suitably attached to the metal frames but insulated from them by felt. Such felt insulation is desirable for walls, ceiling and flooring. The completely insulated cabin should be seriously considered even at the expense of weight and complication.

Doors should be rigidly sealed in a felt weather-stripping, and some positive locking device should be used to insure that the door will not vibrate in flight. If the panel of the door is large, a damping pad similar to that used for the outer skin should be fixed in place.

Material	Absorption coefficient at 512 cycles	Approximate weight lb./sq. ft.
Balsam wool, soft wood fiber, paper backing, scrim fairing, 1" thick...	0.50	0.254
* * *		
Draperies, hung straight, in contact with wall, cotton fabric.....	0.11	0.0694
* * *		
Velour fabric, hung straight, in contact with wall.....	0.35	0.125
* * *		
Cotton fabric, draped to half its area.....	0.15	0.0971

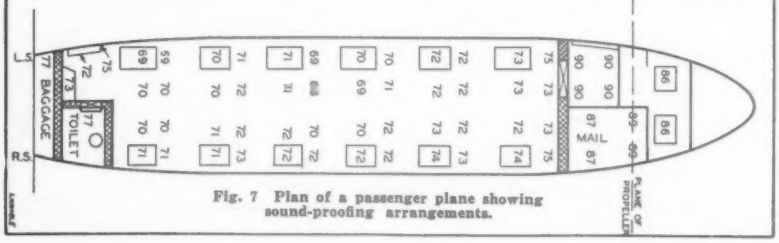


Fig. 7 Plan of a passenger plane showing sound-proofing arrangements.

CLATTER DUE TO LOOSE PARTS

SMALL loose furnishings in the cabin can cause considerable annoyance by noise and clatter. Loose ash trays for example will cause a disagreeable noise. In one ship, a long rail in the baggage rack made a very appreciable noise; felt mountings and a few ounces of waste stuffing silenced it. Chairs in particular should be mounted on felt not only from the point of view of noise but to prevent transmission of vibrations to passengers. In general all items such as ash trays, magazine racks, foot rests, etc., should be securely fastened and their insulated contacts with the structure frequently checked.

SOUND ABSORBING MATERIALS

IN the first article we established the importance, not only of sound-proof-

(Concluded on page 399)

Data on Lightplane Performance

by WILLIS L. NYE

Many important points in the design of the wings for a lightplane are considered by Mr. Nye with conservation of power as the leading consideration.

THE increasing popularity of the home-built lightplane is now an established reality. Engines now available commercially, although limited both in weight and horsepower, will enable the home constructor to achieve a fair performance, provided the home-built airplane is of suitable design and construction required for flying.

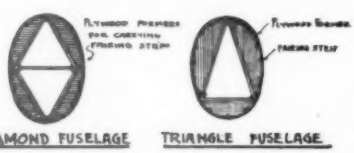
Up to the present time there has been, however, a notable lack of cleanliness both in the designs chosen for home construction and in the actual workmanship itself. These factors have reacted unfavorably toward amateur light airplane construction by professional sources.

In order to secure a reasonably good performance, every possible advantage, both aerodynamically as well as structurally, must be employed in the general design. If these features have boosted commercial aircraft to speeds well above 200 m.p.h. they will help in the lower powered class as well.

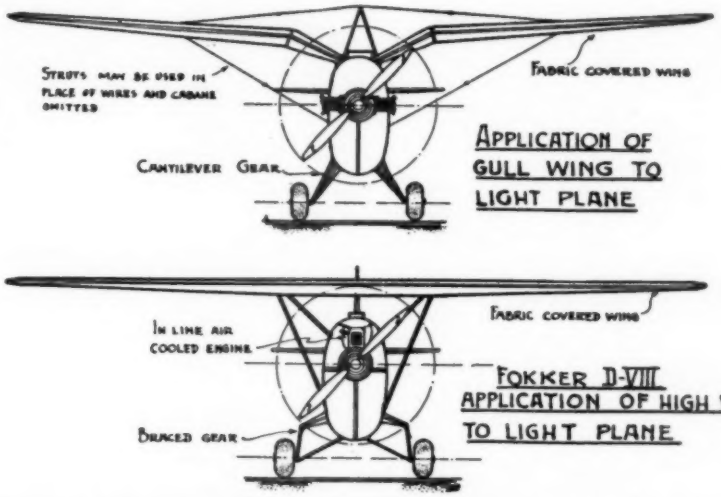
It is at once apparent, since we have so few horses to play with in a lightplane motor, we cannot afford to dissipate many of them in overcoming useless drag. Performance in the lower powers can be improved immensely; first, by proper structure; second, by proper weight to strength ratios; and third, the landing speed need not suffer.

If good design is incorporated, then the speed ratio can easily be increased to nearly three times the landing speed over and above a doubtful ratio of two, that seems to exist at present. Low drag and light weight will improve the climb and top speed yet not detract from the landing speed, and the same time will place the lightplane in a class comparable to the usual run of two-place commercial airplanes.

The normal home-constructed lightplane of today is a combination of a parasol braced monoplane wing and a tractor propeller arrangement. Fair results have been achieved from this arrangement. Experience has proven this combination can be improved aerodynamically as well as structurally. It appears logical, since we are dealing with limited power, to build the best possible aerodynamic structure and this can only be done by adopting some of the newer arrangements of structure.



Fuselage cross-sections with diamond and triangular longerons.


STRUTS MAY BE USED IN PLACE OF WIRES AND CABANE OMITTED
FABRIC COVERED WING
CANTILEVER GEAR
APPLICATION OF GULL WING TO LIGHT PLANE
IN LINE AIR COOLED ENGINE
FABRIC COVERED WING
BRACED GEAR
FOKKER D-VIII APPLICATION OF HIGH WING TO LIGHT PLANE

Typical wing arrangements for lightplanes which have an important bearing upon the fuselage design and which should be carefully considered by the amateur builder.

The high-wing braced parasol was in all probability the first really efficient light airplane that had fair performance. Its popular acclaim was due to its good visibility, good climb, good stability, ease of construction and low cost. Later experience has proven other types of aircraft can be built in the low power field by adapting some of the newer aerodynamic ideas to this class of airplanes. These newer features will give increased performance as well as a finer outward appearance.

The high-wing braced parasol airplane has served its day as built in its present obsolete form with long lift and diagonal struts for the necessary strength, contributing a considerable drag creating element. Of course, some of these newer ideas will mean increased technical work and research, but then again isn't that half the fun with home construction?

If a high-wing type of airplane is desirable why not brace the wings with short rigid struts, place the pilot a trifle to the rear and fair the wings in gull fashion to the fuselage top? This feature has been proven to be good practice both militarily and commercially. It is not difficult to build and is very efficient. Such an arrangement combines speed and low drag. The gull-wing arrangement is best possible with a lower aspect ratio than nominally used in lightplanes, but the characteristics gained will offset the loss from induced drag effects. It is also feasible to erect a cabane to carry the landing wires to the top of the wings, and rig the flying wires down to the fuselage or landing-gear. Such a truss is amply strong and gives a very light weight to strength ratio. The wire braced arrangement will give increased speed over the lift strut variety.

In small planes, the low-wing design allows a great strength to weight ratio. This type can be built using the normal wire braced truss similar to the G-B racing planes, or with a full cantilever arrangement. If the plane only is built for one passenger and of light weight, a rectangular wing can be used without any bracing at all, similar to the Czekely sportplane, if a deep enough spar can be secured by use of a high lift wing airfoil.

For short spans tapering is unnecessary and the landing-gear can be carried on a streamline steel tube tripod frame. For ordinary flying this design is plenty strong. A ship of this sort could be sturdily built with a clean outside appearance and yet be speedy.

The gull-wing design may be used inverted, and in this manner is very efficient and eliminates fillets. The wings are pin jointed to the fuselage and braced with streamline wires. This assembly reduces drag to the minimum. Another idea along these lines, would be to build steel wing stubs carrying the landing-gear, and being of sufficient rigidity to carry short cantilever wing stubs. The bad feature of "gull" wings is the necessity of using ball joints, bell cranks, etc., to actuate the ailerons. A gull type of low-wing airplane gives very fine visibility and much better performance than the usual low-wing ship.

Recent investigations by the ROYAL AIRCRAFT ESTABLISHMENTS in

England show that a high-wing monoplane gives about 5 percent more lift than a low-wing, while a mid-wing slightly above the center of fuselage resistance, gives the best average aerodynamic characteristics. If these experiments mean anything, a system similar to the wartime FOKKER D8 would be worth trying. The wing is carried straight across the top on cabane struts above the fuselage and is cantilevered toward the wing tips.

The visibility and stability are excellent and the tapered wing will give good aerodynamic performance. The system is well worth serious thought. This design could also be produced with a rigid streamline cabane of tubing and a wire bracing scheme.

The mid-wing monoplane is the least popular. It does not possess as many attractive advantages as the other system and has poor visibility. The Church mid-wing, an adaptation of the Heath parasol, is an example that is somewhat faster than the prototype. The mid-wing would be braced easily with rigid streamline struts similar to the Army XP-934 pursuit airplane.

Raising the wing midway up the fuselage sides allows the lift strut to make a better angle with the main spars. Such a system might also be adapted to an inverted gull-wing or the normal low-wing airplane.

The question of bracing involves weight to strength. For small spans the cantilever wing will weigh the same as a braced wing. For large spans the cantilever will be heavier. Wire bracing, provided it is disposed and rigged correctly, is lighter than strut assemblies and has considerably less drag. It, however, necessitates constant attention to rigging and tightening.

A point to remember is that the bigger the angle of the brace to the spar the more favorable from a strength standpoint is the brace. The present-day parasol, due to the large drag of the long lift struts, is prohibitive as judged by today's standards. Much lies in favor of wire bracing if it is correctly engineered. Wires possess the greatest strength to weight ratio possible.

The trend of aerodynamic design is in favor of the monoplane. The flying wing, judged from that viewpoint, would appear to be a lucrative field for the lightplane builder. With a proper high lift wing section there is no reason why an enormous load could not be carried. It is rational to assume such a job with a light outrigger tail unit, could possess good performance as well as speed in general. This flying wing idea will bear more fruit but at present it needs further investigation and experimentation.

For those that prefer biplanes similar improvements can be made in them to increase the performance. The biplane inherently will be heavier area for area and cost more to build. If taken on a basis of equal load factors it is *no stronger* than the monoplane

(Continued on page 396)

The "Flyabout" Cabin Type Lightplane

A side elevation of the Porterfield "Flyabout" showing its clean lines and excellent vision.

A NEW lightplane cabin job known as the Flyabout is to be produced by the Porterfield Aircraft Corporation, Kansas City, Mo. This ship was designed by Noel R. Hockaday, a pioneer in airplane construction.

This plane weighs less than 650 pounds when powered with a 65 h.p. LeBlond engine and it is said that the ratio of power to the weight is much greater than with any similar plane now on the market. At a cruising speed of 100 m.p.h., the fuel consumption is four gallons per hour.

This ship is notable for its high degree of visibility for both the passenger and the pilot. A wide door provides an easy entrance and there is a roomy baggage compartment which is accessible from the cabin. A total of 25 pounds of luggage may be carried but this limit can be further increased when the combined weight of the passenger and pilot is less than 340 pounds.

SPECIFICATIONS

Wing span	32'-0"
Overall length	20'-0"
Height	6'-7"
Landing-gear tread	66"
Power plant	65 h.p.

PERFORMANCE

Top speed	115 m.p.h.
Cruising speed	100 m.p.h.
Landing speed	40 m.p.h.
Cruising range	350 miles
Climbing rate	800 f.p.m.

The Flyabout is offered with the choice of two engines. With the standard 65 h.p. LeBlond, the price is $1,245. With a 70 h.p. engine the ship is priced at $1,475, both being based on Kansas City deliveries.

Determining the Parasitic Drag

by GEO. G. VINCENT

THERE is no theoretical basis for an assumption that parasite drag is in any way proportional to weight, and to convey such an impression to the reader would be to create an erroneous conception.

It is, however, quite logical and in keeping with good practice to presume that the larger the structure of the airplane the greater cross-sectional area it will present to the air-stream and hence the more head resistance it will have, other things remaining equal.

At first thought, the seemingly logical method for estimation of parasite drag would be the sumnation of the drag of all the various parts of the airplane structure that are exposed to the air-stream. It would obviously include all items such as fuselage, chassis, struts, cowling, etc. This method can only lead to incorrect results, inherently as approximate as most empirical methods, since the interference between parts can not be correctly accounted for.

Hence the only accurate method is by wind-tunnel tests of the model and even here inaccuracies are bound to creep in as a result of scale-effect, wall-interference and the like. This method also offers the disadvantage of being unavailable to the vast realm of embryo designers. We must, therefore, resort to the empirical methods founded on past experience, coupled with our own good judgment and discretion.

It is the writer's intention to set forth in this work practical methods and formulae, which are in keeping with good design practice, and which border on the conservative. Complicated mathematics will be avoided and anyone conversant with the use of simple decimals should have no difficulty in solving the equations.

The first equation for the parasite drag coefficient will be written on the basis of an average airplane with excessive drag and will be corrected for other conditions. The formula for parasite coefficient will then read as follows:

$$\text{Parasite Drag Coefficient} = (.0068\ W + .01) \qquad (1)$$

$$\text{Parasite Drag} = (.0068\ W + .01)\ V^2 \qquad (2)$$

Where (W) is equal to $\frac{\text{Weight}}{1{,}000}$ and (V) equals the velocity in miles per hour.

An illustrative problem will be offered to clarify the equations.

(Concluded on page 392)

The Corben Converted Ford "A"

by O. G. CORBEN

O. G. Corben, long known in lightplane circles and as a manufacturer of lightplanes, has just completed a Ford "A" conversion for adapting this motor to his new lightplane.

JUST take a look at the accompanying photographs and "Believe it or not," it is none other than a good old Model A Ford motor all dressed up in its aviation accessories, ready to give a great many hours of reliable service. I make this last statement because this motor has already been thoroughly tested on a torque stand so all the guess-work has been taken out.

Maybe you are one of the many who think that it is necessary to have a high-priced aircraft engine in the nose of a plane before you can obtain reliable performance. I will admit that I doubted very much if a converted automobile motor could be made to really stand up for flying service day in and day out.

However, I thought of that old saying, "One is never too old to learn," whereupon I looked up some of these daring young men (so I thought) who were brave enough to try and fly a ship with an old Ford motor stuck in its nose and much to my surprise they actually got off the ground and some of them flew very well.

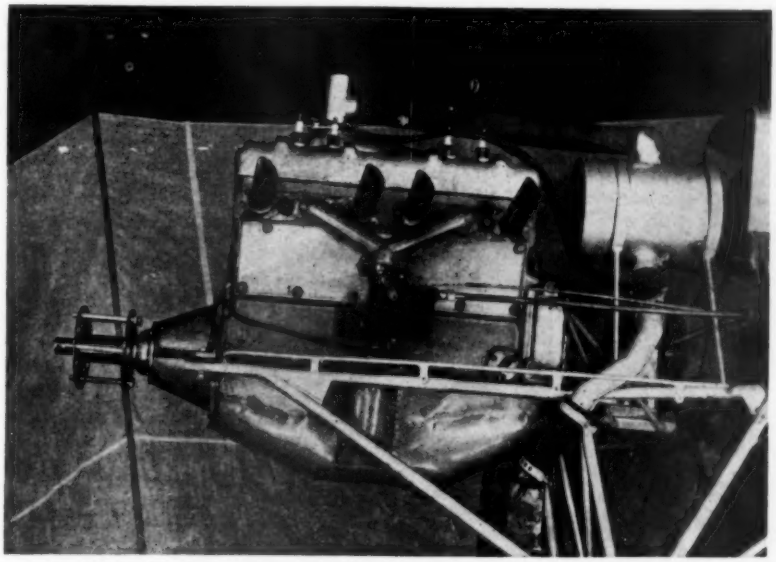
It seemed to me that if a makeshift conversion could do that good, a little study on the matter could produce an up-to-date motor to meet the demand at a very low cost, so after listening to some of the faults, I decided to doll the old Ford motor up into a first class airplane engine and all that goes with it.

Naturally, redesigning an engine was a little out of my line for I have always concentrated on the designing of planes, but I did know what kind of a finished job I wanted. And so I called on Mr. H. S. Sawyer, a man who really knows what it takes to make engines do what you want them to, and much to my surprise he had been dreaming and hoping for the chance to do his stuff on a conversion.

He sure did it up in great style. Nothing was left unturned to transform Henry into just as good an aircraft motor as it had proved itself on the ground. Sawyer's efforts were not in vain, therefore we take great pride in giving you the dope on one of the sweetest little engines that ever consumed a gallon of gas.

Now that I am through bragging, I'll give you some of the details on the changes that were made.

First, it was necessary to cut down on the weight in order to get the desired performance. This was accomplished by replacing some of the simple iron castings with aluminum, the timing-gear casting was replaced, the old head was junked and a new one designed of aluminum. The oil pan was discarded and one was welded up of light sheet metal. The sides of the block were taken down on a milling machine although this, we later found, did not reduce the weight enough to bother with in the future.



A side elevation of the Corben conversion. Hardly looks like a Ford engine, does it?

Second, we wanted the motor to turn up at a high enough speed so as to deliver all the horsepower possible. This meant that a high-pressure oiling system was necessary, so a Chevrolet oil pump was installed in place of the Ford pump, the oil was piped to all the main bearings and on this first motor the crankshaft was drilled. However, it is not necessary to do the latter job.

Third, a high compression head was important. We found a few such heads on the market but none were just what we wanted. Therefore, a new head was designed, one that would afford the proper cooling and eliminate the possibility of any steam pockets forming.

Next, a high-tension magneto was coupled to the rear of the motor by means of a rubber coupling, a coupling which would allow very fine timing adjustment as well as offset any misalignment of the mag.

In designing the head, the water-pump was left off and instead, a special pump was installed alongside the block, driven by a "V" belt off of the pulley combined with the magneto drive coupling.

Sheet aluminum was used in making up the cover-plate for the valve-housing, as well as the rear timing-gear plate. A tach shaft coupling was machined into the cam-shaft and extended out of the rear cover-plate.

As you will note from the photograph, a special casting has been added to the front end of the motor to accommodate a roller thrust-bearing. A stub shaft is pressed and keyed to the crankshaft. Also, unlike most conversions, a propeller hub is used in place of bolting the propeller direct to the flywheel flange. The propeller hub has a special lock nut which also acts as a puller when backed off.

The new type spark plugs are used and bronze bushings were screwed into the aluminum head to receive the plugs.

After the motor was completed, it was installed on a torque stand and run for several hours at slow speed without any signs of "bugs." It was then speeded up and horsepower readings made.

A Szekley 45 h.p. propeller was first used on the stand and the engine turned this prop up to 1,950 r.p.m. without any effort. At 1,925 r.p.m. the reading was 52 h.p., which was about what we wanted. However, when the engine was turned up to 2,600 r.p.m., a reading of almost 60 h.p. was shown. The engine was run at this high r.p.m. for quite some time without showing any signs of failure.

It is planned to let the motor turn up about 2,100 r.p.m. in the air when installed in a plane which will give the ship a top speed of approximately 100 m.p.h. and a cruising speed of 85 m.p.h.

With all these changes, it may seem that the motor would be about as expensive as some of the lightplane engines, but actually, the price will be

(Concluded on page 401)

Where Are the Glider Clubs?

by "SPEED" WESTPHAL

The author, a noted glider pilot, believes that there is still a great deal of interest in gliders, and therefore issues this call to all young men who wish to take up gliding under expert supervision.

THE airport manager walked up to the ship my partner and I had just taxied up to the hangar, and inquired as to whether or not I could get hold of a glider club that possessed a glider.

"Why?" I asked, with a bit of surprise.

"Oh," he said, "I'd like to have one around the airport for an attraction. You know how a glider will pull the motorist into the airport. Once we get the Sunday motorist on the field, we don't have much trouble selling them a plane ride."

Waiting patiently, while I crawled out of the crate, the manager continued:

"We'd be glad to give the club free hangar space for the glider and besides that, pay a part of the tow-car gas expense."

Well, boys and gals, when I heard that, my helmet and gogs took a sudden unannounced departure for the stratosphere. It sounded very much to me like the much-talked-of depression was over, but it also made me think that perhaps the Middle-West gliding movement was sort of neglected as well.

Back in the year of late '29, the Windrider Glider Club of which I was a member was given free hangar space and mechanical service for their glider at the Sky Harbor Airport. It was proven, without a doubt at that time, that a good-looking glider was an asset to any airport which depended on the Sunday visiting public. I know hundreds of air-minded persons that would drive fifty or sixty miles, just to watch a glider fly.

Nothing thrills the good old American public quite as much as a crack-up and the motored planes are now so advanced in design that crack-ups are few and far between. But with gliders, that's another thing. Wherever you find a glider, you're bound to find one of those guys that still thinks he can do an inverted loop in a primary ship, but I'm getting away from the original idea behind this story, so let's kick on a little rudder and get back on the course.

In 1930-31, there were something like seventy-five glider clubs in the state of Illinois alone. I, myself, test-hopped about half of this number which were very nice jobs, constructed from the "Mead" kit. If I remember correctly, the best-looking and best-performing ship was that built by the Illini Flying club of the University of Illinois.

Incidentally, if the treasurer spots this article, he might send me three bucks to cover the expense of buying the club's breakfast on the morning of the test hop, remember?

I've still got a cold from sleeping in that dormitory. No kidding, it was three degrees colder than a Xmas morning at Little America. Anyway, we all had a swell time. The question is, what became of all these fine clubs? I can account for only one of them.

This glider, built by the Washington Glider Club, is a fine example of what can be accomplished by glider clubs composed of active, interested members.

Out of the Windrider Glider Club, Palatine, Ill., Charles Abel is the only one still playing with gliders, he being the former holder of the glider loop record and present owner of the old "Heath plane," now at Sky Harbor. Walter Abel, Charlie's younger brother, is now pushing "crates" around for the U.S. Marines down south. A. B. (Abie) Brix is with the government boat crew that keeps the waters clear of pirates and smugglers and, now and then, saves a fan dancer from drowning (Get it?).

Hank Collignon, the flying milkman, traded in his wings for a very very nice piece of jewelry and is all set for a tail-spin on the altar with another member, who apparently, doesn't like her last name. Last of all, I'm in the business of writing and producing radio shows for the dear old listener-inners with a few days off, now and then, so I can go out and hop a few clouds with the old but reliable "Fledg."

But take it from me, when spring pops up with its soft breezes blowing, robins and meadow larks singing and love givin' a guy ideas, I'll have a nice new glider up in the atmosphere, listening to the wires sing out their song of defiance to gravity.

Now, what about you other fellows; are you going to act as pallbearers, and stand by while they bury the spirit of gliding under six feet of neglect—under a tombstone of history? I'm asking you as a pioneer, and I'm asking you through this great publication, POPULAR AVIATION, because I know darn well you all read it today just as you always have done.

Let's all see that this great sport gets back on a running basis. There are thousands of young fellows in Chicago alone, that would give their right arm to actually get off the ground, but what's the answer? They can't afford it. No! They can't afford it alone, but if ten of these fellows could get together, I'll bet they could and would do it.

It's up to us fellows who have been in the game and know the ropes, to give these beginners a helping hand and right now, I'm ready to start the ball a-rolling. With winter just around the corner, these beginners will have plenty of time to construct a nice glider and have it all ready for spring.

I'll need a lot of help in this thing, so, first of all, I want all you men who have been active members of a club and who have built and flown gliders, to get in touch with me through this publication at once. Let me know how much experience you've had, the number of your pilot's license if you have one, and whether or not you would be willing to spend a few hours a week, gratis, organizing and instructing a group of beginners in your locality. Also, if you have a glider and how much it could be purchased for.

Second, I want all you fellows that are actively interested in learning to fly and who are willing to work and spend some time at it, to write me, giving the following information: Age, school you attend, names and addresses of boys or young men's clubs you belong to, and if you know of any vacant

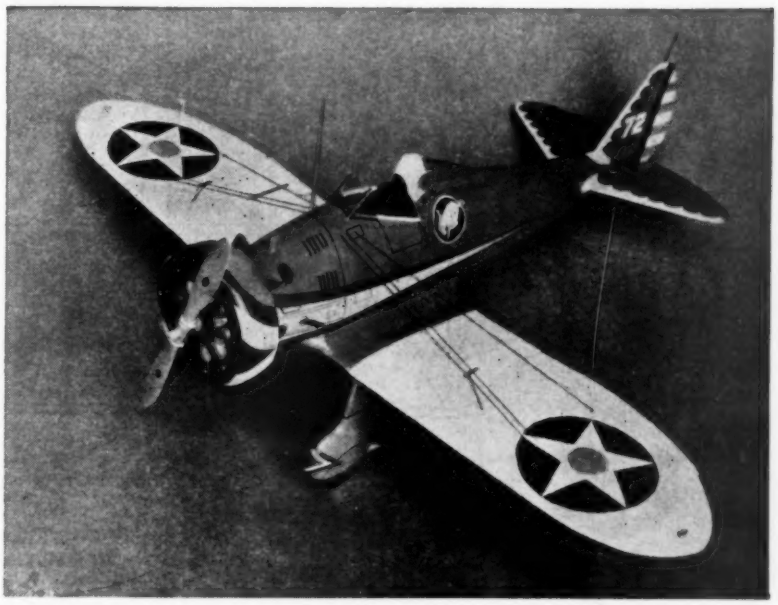
(Concluded on page 394)

Building the Boeing P-26A

by

PAUL W. LINDBERG

Model Editor and Model Designer for
POPULAR AVIATION



The completed Boeing P-26A is a very realistic model, yet one that is made easily. Its flying ability has been demonstrated.

THE Boeing P-26A is a ship most of you model fans have been waiting for and our laboratory is very proud to present plans and instructions for building this trim little fighter. Not only does it have a striking appearance but flies equally as well.

We have obtained all data necessary for completing this model, even to the correct color scheme used by the 95th Pursuit Squadron. Weight of model complete, ready to fly—1⅞ ounces. Distance of 200 feet or better, flying between 25 to 35 m.p.h.

Please note all advanced features, such as movable controls with aluminum hinges, fuselage construction, shock absorbers, landing-gear, etc., are exclusive features developed only by our laboratory.

In building the model, all dimensions can be quickly and accurately determined by placing a ruler on the part to be measured. The plan is printed full size. If you wish a larger model, multiply this measurement by the amount of increase.

CONSTRUCTION OF FUSELAGE

The fuselage sides are built from 1/16-inch square balsa. The longerons, verticals, diagonal braces, etc., are held in place until securely cemented by inserting straight pins on either side of the strips wherever needed. After the two sides are completed, they are pinned to the top of the plan in such a manner that the top longerons face down and so that the sides form right angles with the surface of the plan. The cross-members are now cemented in their proper locations. Cut formers from 1/32-inch sheet balsa and cement in their respective positions as shown on the plan.

The balsa nose on front of fuselage is carved from a solid block of balsa. After this has been properly shaped and sanded cement to front end of fuselage.

The 1/32 x 1/16-inch stringers should now be cemented over the formers on fuselage. Please note that the stringers are cemented to outer edges of formers so that a smooth covering job may be obtained. This eliminates all projecting formers.

A stiff grade of paper is used for cockpit cowling and between F-1, F-9, F-17, and nose block.

DUMMY MOTOR COWLING

This is made from balsa, carved and sanded to shape as shown on plan. Grain of wood in cowl should run parallel with line of flight, as this will give a better finish when sanded.

DUMMY MOTOR

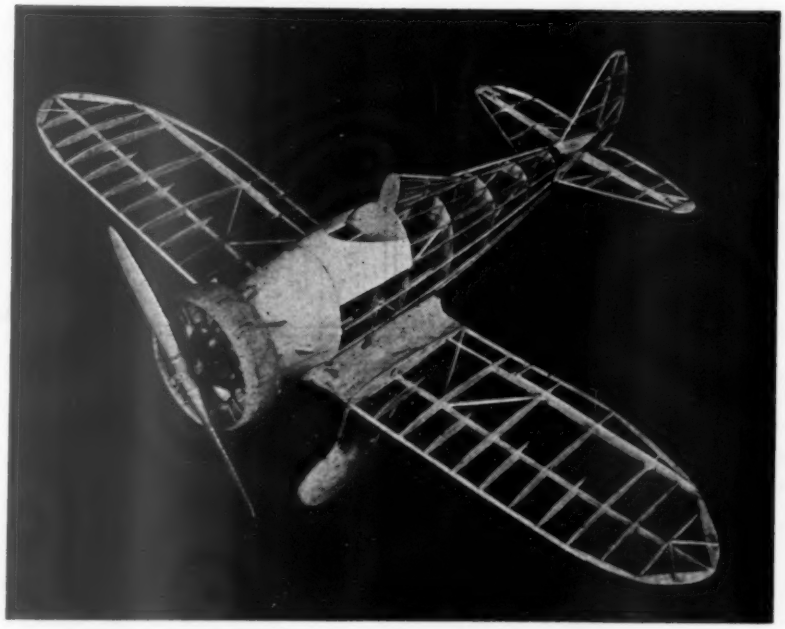
The motor is built up entirely from balsa and sheets of stiff paper. The cylinders are built first, using the sheets of paper cut into discs to represent fins, the layers in between these are made from 1/32-inch sheet balsa.

Note the nine small fairings cemented to nose block. These receive lower ends of push-rods when cylinders are cemented in position. The exhaust-pipes are made from a soft grade of balsa.

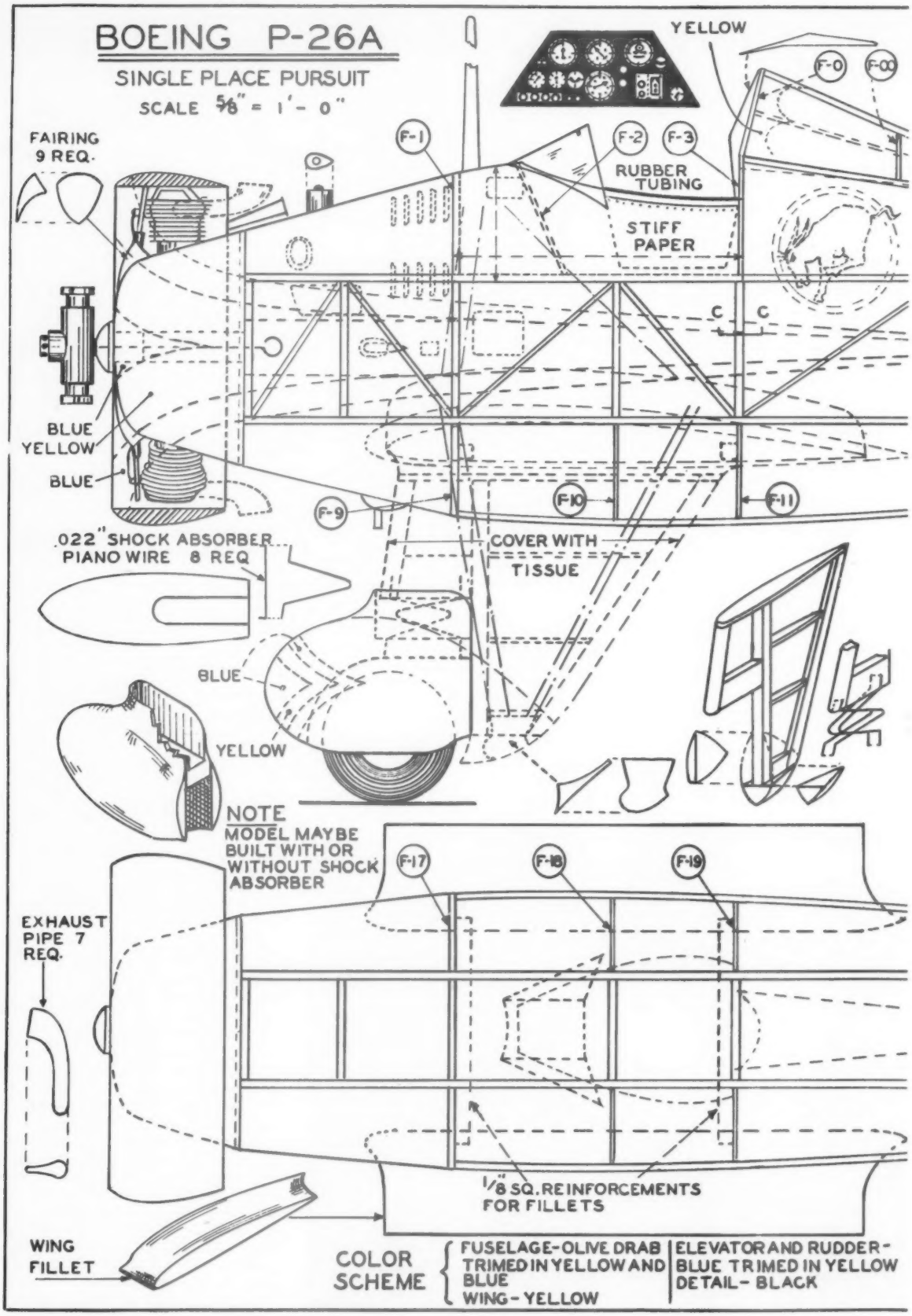
LANDING-GEAR

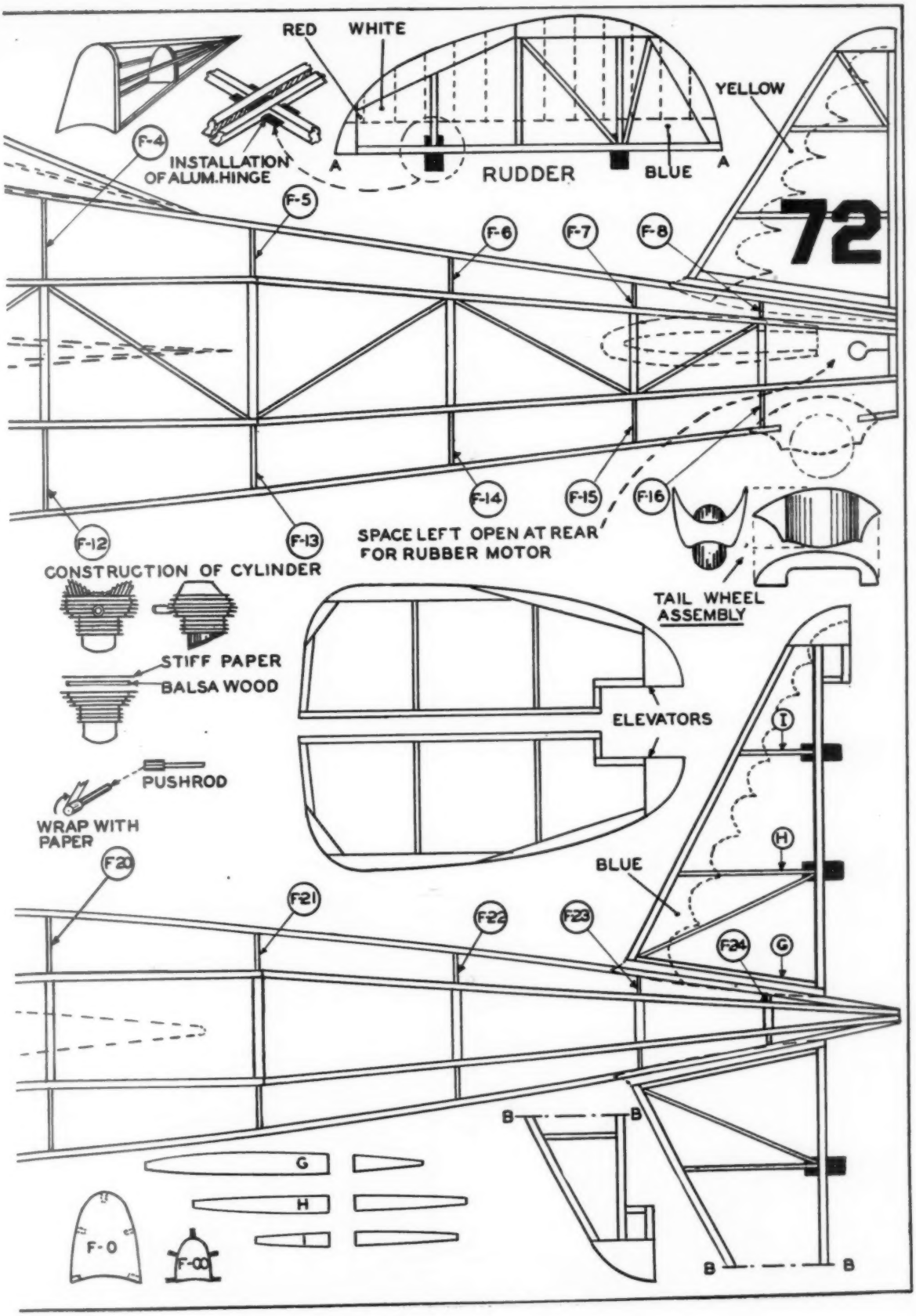
A strong grade of balsa is used for

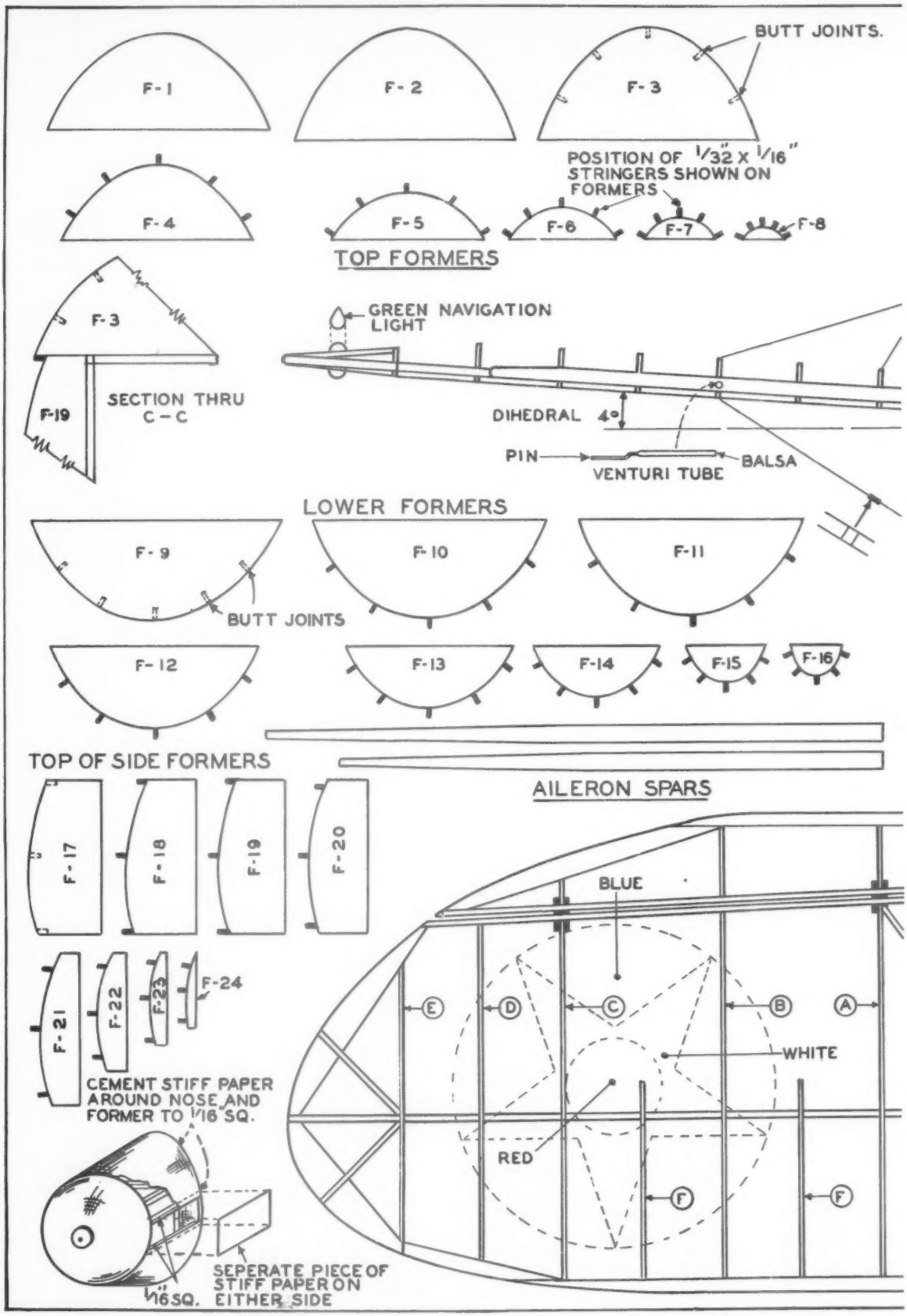
(Concluded on page 396)

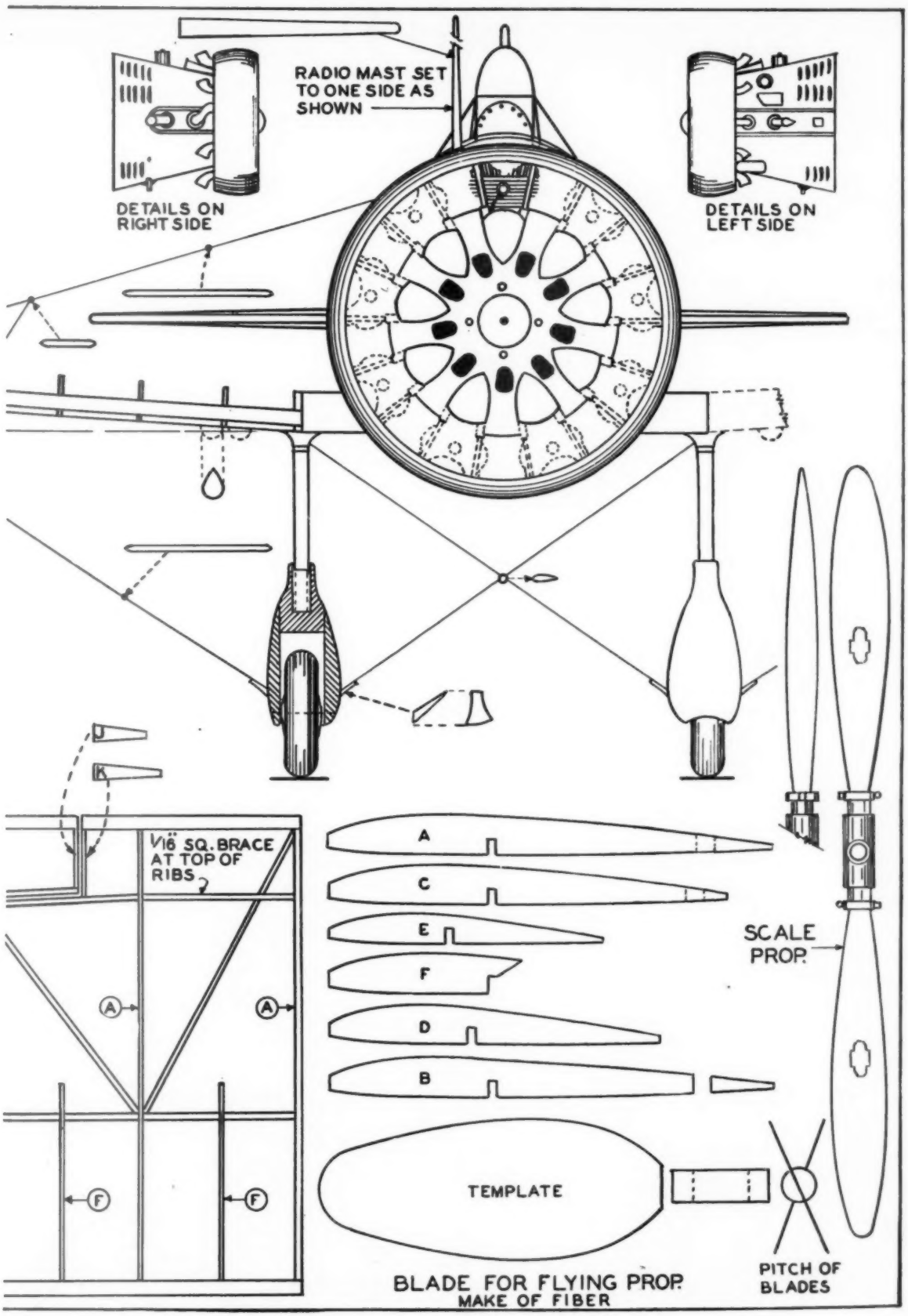


The framework of the Boeing P-26A before covering.


BOEING P-26A
SINGLE PLACE PURSUIT
SCALE 5/8" = 1'-0"
YELLOW
F-0
F-00
FAIRING
9 REQ.
F-1
F-2
F-3
RUBBER TUBING
STIFF PAPER
C
C
BLUE
YELLOW
BLUE
F-9
F-10
F-11
.022" SHOCK ABSORBER
PIANO WIRE 8 REQ
COVER WITH TISSUE
BLUE
YELLOW
NOTE
MODEL MAYBE BUILT WITH OR WITHOUT SHOCK ABSORBER
F-17
F-18
F-19
EXHAUST PIPE 7 REQ.
1/8 SQ. REINFORCEMENTS FOR FILLETS
WING FILLET
COLOR SCHEME
FUSELAGE-OLIVE DRAB TRIMED IN YELLOW AND BLUE
WING-YELLOW
ELEVATOR AND RUDDER-BLUE TRIMED IN YELLOW
DETAIL-BLACK


RED
WHITE
YELLOW
F-4
INSTALLATION OF ALUM. HINGE
A
RUDDER
BLUE
A
72
F-5
F-6
F-7
F-8
F-14
F-15
F-16
F-12
F-13
SPACE LEFT OPEN AT REAR FOR RUBBER MOTOR
CONSTRUCTION OF CYLINDER
TAIL WHEEL ASSEMBLY
STIFF PAPER
BALSA WOOD
ELEVATORS
I
PUSHROD
WRAP WITH PAPER
H
BLUE
F20
F21
F22
F23
F24
G
B
B
G
H
F-0
F-00
B
B


F-1
F-2
F-3
BUTT JOINTS.
POSITION OF 1/32" X 1/16" STRINGERS SHOWN ON FORMERS
F-4
F-5
F-6
F-7
F-8
TOP FORMERS
F-3
F-19
SECTION THRU C-C
GREEN NAVIGATION LIGHT
DIHEDRAL 4°
PIN
VENTURI TUBE
BALSA
LOWER FORMERS
F-9
F-10
F-11
BUTT JOINTS
F-12
F-13
F-14
F-15
F-16
TOP OF SIDE FORMERS
F-17
F-18
F-19
F-20
AILERON SPARS
F-21
F-22
F-23
F-24
CEMENT STIFF PAPER AROUND NOSE AND FORMER TO 1/16 SQ.
BLUE
WHITE
RED
E
D
C
B
A
F
F
1/16 SQ.
SEPERATE PIECE OF STIFF PAPER ON EITHER SIDE


RADIO MAST SET TO ONE SIDE AS SHOWN
DETAILS ON RIGHT SIDE
DETAILS ON LEFT SIDE
1/16 SQ. BRACE AT TOP OF RIBS
A
C
E
F
D
B
SCALE PROP.
TEMPLATE
PITCH OF BLADES
BLADE FOR FLYING PROP.
MAKE OF FIBER

Shooting Model Dog-Fights

by ARNOLD PEARSON

Stage and photograph your own war scenes, dog-fights or formation flights according to the instructions given here. You will get a big kick out of this stunt and a lot of interesting photographs as well.

MUCH has been written and many pictures have been painted of the famous air battles of the World War, but here is a new and more realistic way of depicting these famous "dog-fights." It consists simply of mounting two or more models, constructed to the same scale, in the proper position against a suitable background.

Several famous fights will be immediately suggested to the model builder, such as: The death of Richthofen and other victories by famous aces as, Ball, Bishop, Barker, Fonck, Udet, and Boelke. Suggestions may be obtained from the covers of air-story magazines which show striking color schemes and positions of the planes in an actual dog-fight.

To illustrate only one of the many possibilities, the victory of Eddie Rickenbacker has been constructed in miniature. In this particular fight, Rickenbacker saw a German Fokker D-7 diving at a two-seater which was taking pictures at a lower altitude. At the right moment, "Rick" pulled up in a stall and began firing. The Fokker dived right through Rickenbacker's fire and was riddled from propeller to tail.

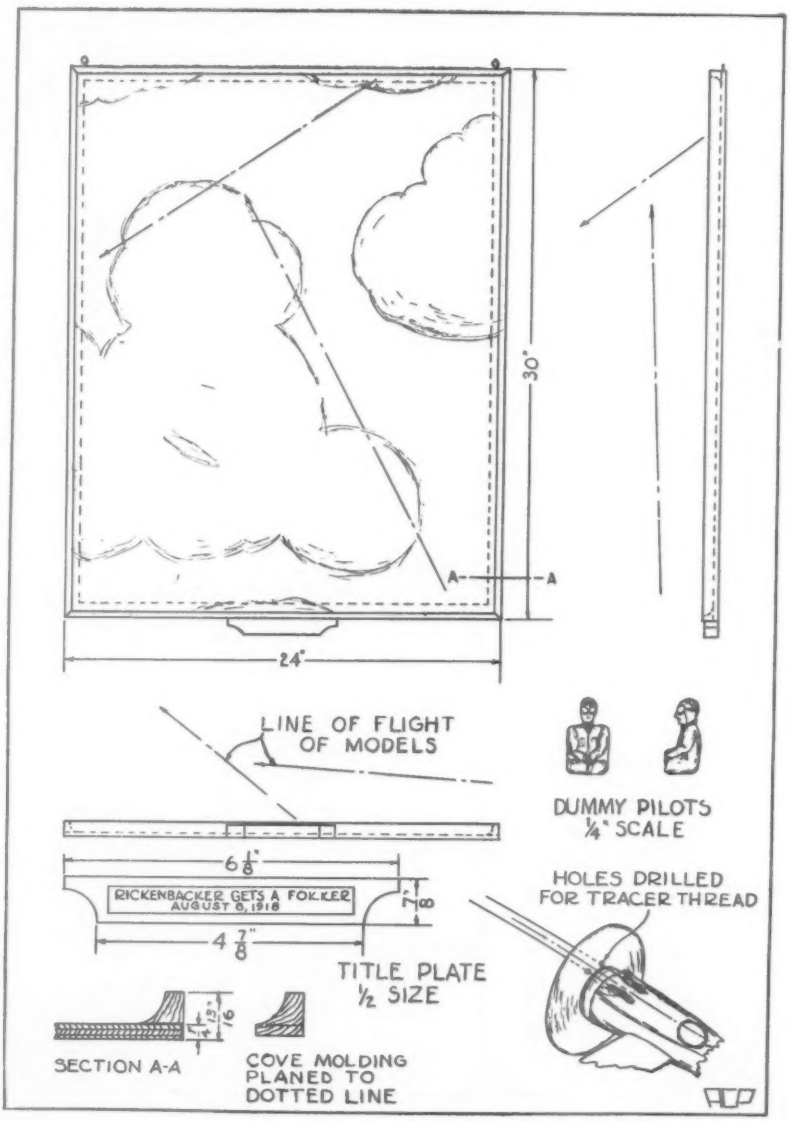
The instructions that follow are general and may be used to reproduce any battle. In making a miniature dog-fight, first determine the overall size of the background. This will vary for different model makers according to the available wall space, etc. A good average size, used in the original, is 24"x30". The scale of the models for this size should be ¼" = 1'. By using a scale of 3/16" = 1' a slightly smaller background may be used; or more than two planes may be used with the larger background. Be careful not to make the models too large for the size of the background, otherwise it will look too crowded.

This dog-fight between an Allied and German plane was made by the methods described.

After determining the size of the background and the scale to be used, make the models. You can obtain 3/16" and ¼" scale plans from model magazines. The plans for the Fokker D-7 and Spad were obtained from a model airplane supply company.

In making the models it is not necessary to put a lot of detail on them, the most important thing being to get the same colors and markings on the models as on the original plane. The spinning propeller is indicated by a piece of celluloid cut in a circle of the diameter of the propeller. It will look more realistic if the center of the circle is rubbed with some fine sandpaper. Fasten these discs to the models with pins. The dummy pilots are made as shown in the drawing and glued in the cockpits. Either pine or balsa may be used.

The background comes next. It consists of a piece of ¼", 3 plywood cut to the overall size and some cove molding. The molding is planed down on



one edge and fastened to the plywood by means of screws and glue. After the glue is dry, sand the hollow part of the molding so that it fairs right into the plywood. Thus, when it is painted, the joint will not be visible.

Next, make the brackets which hold the models to the background. After deciding on the position of the models on the background, determine their position as related to the eye level when the completed picture hangs on the wall. In this way you will be able to place the models in such a way that the models themselves will hide the brackets. The brackets may be made from ⅛" diameter rod or from a flat strip about a ¼" wide. Holes must be drilled in both ends in order to fasten them to the plane and background with screws. If rod is used flatten the ends before drilling.

You are now ready to paint the background. Before doing this however, fasten the models temporarily in place in the position you want. After they have been adjusted to your satisfaction, take them off and give the background and frame two coats of flat white paint, sanding between coats. Painting in the sky effect is not as difficult as it appears. If you cannot decide on the composition of clouds, look through some magazines until you find something you like.

In mixing the colors, simply take some flat white and mix with it some blue enamel or oil color until you get the shade desired. Mix a touch of red in the blue to kill the brightness. Paint the blue on now leaving white spaces for clouds. While the blue is still wet, paint in the clouds, overlapping the blue slightly to give the clouds a fuzzy effect at the edges. Also shade the clouds at the bottom slightly. After this has dried, paint the top and edge of the molding aluminum.

Fasten the models on the background now. The tracer bullets are indicated by white thread. The pieces of thread are fastened to the machine guns of the Spad, passed through holes drilled in the celluloid disc (see drawing), and fastened to the bottom of the Fokker. The lines of tracer should not be parallel, but should converge slightly toward the Fokker. Be sure that tracer is in line with center line of the Spad. Fasten two hook-eyes to the top of the picture and your miniature dog-fight is complete.

Of course, this idea can be expanded indefinitely and need not be confined to dog-fights alone. For example, it is a good way of recording squadron formations and various squadron maneuvers. What would be more thrilling than a formation of bombers being attacked by enemy pursuit ships or some similar action?

Of course, squadron formations call for many models, but on the other hand, these models need not be so carefully finished as other models so that the amount of work will not be as great as it would appear at first glance. And, by the way, don't forget little bunches of cotton for the "Archie fire."

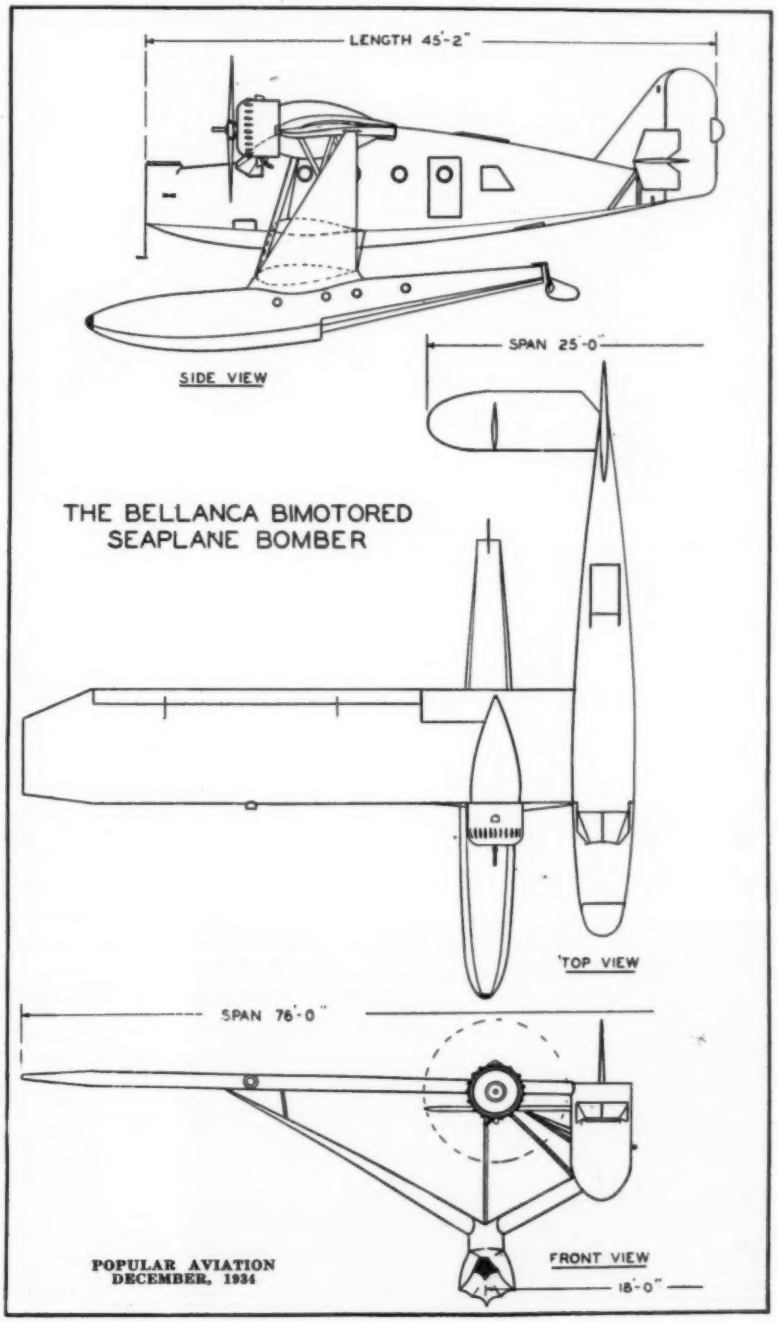
A Scale Model of the Bellanca Bomber

(See the front cover)

SCALE flying models of the large Bellanca Bomber are not practicable for the average model builder, yet the modelist will have a great desire for reproducing this ship as an example of the latest in military airplane development.

It is for this reason that we have decided to show the drawings for a non-flying scale replica of the bomber which is best carved out of solid balsa wood to the proportions given below. The model can be made to any scale desired by the choice of some particular size, using the full size dimensions shown on the drawings.

The fuselage is made all in one piece, carving it out carefully from a solid balsa block. The wings are carved from additional pieces while the floats and tail group are carved separately. After carefully sanding and cementing the parts together, they can be painted according to the color scheme shown on the front cover.



What the Industry is Doing

Latest bulletins from the airplane, engine, equipment manufacturers, and dealers boiled down into a nutshell. Contributions to this department are invited.

G. CORBEN, Corben Sport Plane Co., Madison Airport, Madison, Wis., is about to market a new Ford-motored job. After a considerable amount of experimenting, Mr. Corben and his associates have developed a very fine Ford conversion that stands up well and delivers a surprising amount of power. Full details will be given later in P.A.

ACCORDING to announcements made by United Airlines, this company is extending service to 35 cities in 15 states, including five of the six largest cities in the United States.

JOHN A. CASEY, superintendent of the Chicago Municipal Airport, claims that this is the busiest airport in the world. As many as 900 passengers are being handled daily by 42 scheduled airplane arrivals and 42 departures per day. For the entire year of 1933 there was only a daily average of 486 passengers which, it is believed, will be greatly exceeded this year.

A TOTAL of 748 airplanes were manufactured in the United States during the first half of 1934. There are 13,762 actively licensed pilots in the U.S.A., 642 of these pilots having scheduled air transport licenses. There is still activity in spite of the depression.

SEPTEMBER marked the tenth anniversary of continuous day and night coast-to-coast airmail service. It was celebrated with fitting ceremony by the post office department.

NORTHLAND AVIATION SCHOOL, Minneapolis, Minn., has leased space for shops and offices to the Hanford Airlines. This secures several advantages for the school since the students will now have an opportunity of observing the operations of a major airline at first hand and the advanced students will have an opportunity of working as apprentices in the Hanford shops.

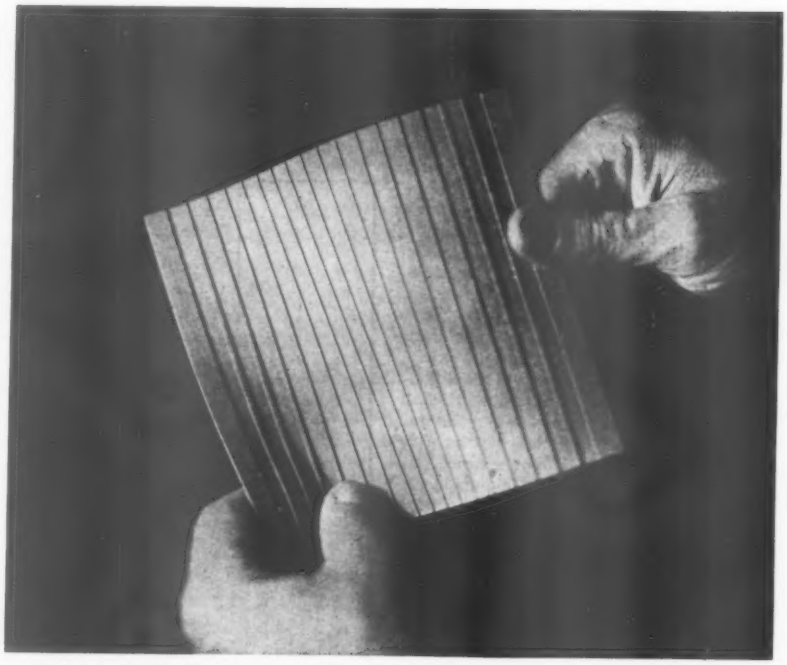
FLYING a new Vultee transport plane, Earl Ward and E. L. Sloniger, chief pilot for the American Airlines, clipped eleven minutes off the record for the flight held between Chicago and Newark, N. J. The old mark was three hours, ten minutes. The new record is two hours, 59 minutes and two seconds.

SLEEPER PLANES are becoming popular. More than 3,500 passengers have been flown at night in the American Airlines' new sleeper planes, according to the management, and it is said that with few exceptions, the passengers have disrobed and used the berths assigned to them.

THE WROUGHT WASHER MFG. CO., Milwaukee, Wis., has added a list of washers to its regular line that are specially adapted to the aviation industry. The washers can be provided in any of the several materials specified by the government: iron, steel, stainless steel, tinned steel, brass, copper, aluminum, and aluminum alloy.

THE TWA is retiring a fleet of veteran Ford tri-motors which have seen nearly a decade of service. They are to be replaced by the newer and speedier Douglas Airliners which TWA is now operating on its coast-to-coast service.

THE EXECUTIVE TRANSPORT is the latest production of the Northrop Corporation. This plane is a development of the Northrop Gamma that cruises at 200 m.p.h. and has a range of 1,600 miles. It contains the latest developments such as electrically controlled wing flaps, sound-proofed cabin, controllable-pitch propellers, controlled ventilators, and numerous interior refinements that make the new model the maximum in luxurious comfort. Hal Roach, the movie producer, and Powell Crosley, the radio manufacturer, are two well-known owners of the new ship.



One of the new flexible storage battery separator plates used in the aviation batteries.

AMERICAN AIRLINES believe that they have set a new record by completely overhauling 60 aircraft engines in one month at the Chicago shops. This was done in 25 days, or at the rate of one and one-half engines per day. Each engine was completely dissembled and every one of the more than 3,000 parts was subjected to rigid inspection. The engines are overhauled every 350 to 400 hours of service regardless of how perfectly they may be operating.

THE PARKS REPAIR DEPOT, instrument laboratory, East St. Louis, Ill., is now fully equipped to repair, calibrate and test the various instruments employed on an airplane. This department is in charge of Burt Gould, who has had extensive experience in the laboratories of Kalsman, Pioneer, and Sperry. The Parks laboratory is regularly servicing the instruments of numerous airplane owners including those belonging to a nationally-known air transport company.

TUBERSPENSION is a new seating principle that is particularly applicable to airplane seats. It avoids concentrating the weight of the body at the sensitive tip of the pelvic bones and thus avoids discomfort due to the intense pressures thus produced. With a Tuberspension seat, the weight is distributed over the entire area of the seat without squeezing action on the nerves, and without causing numbness. Details can be obtained from Tuberspension, Ashland, Mass.

CHARLES D. RUSSELL has been added to the faculty of Parks Air College, East St. Louis, Ill. He is to serve as instructor in airplane mechanics, bringing the total number of instructors up to twelve in the Mechanics' School.

PRIOR to 1926, there were no scheduled air passenger services in this country, and in 1926 only 5,728 passengers were carried over an airway system of 8,410 miles. In 1932, six years later, the number of passengers had increased to 540,681. Based on these figures, with continued healthy increase, the next ten years will witness a passenger-carrying industry running up to five billion dollars yearly.

MONTREAL, home port of the Canadian steamship lines, is 800 miles from the ocean, a river cruise of two days or more. By transferring the mail from the S.S. Empress of Britain to a Canadian Airways plane, the 800 miles overland was covered overnight, thus saving a great deal of time. At Montreal, the mail was turned over to Canadian Colonial Airways, which in conjunction with the American Airlines, carried it to New York. In this manner, mail originating in England was delivered in the United States in four and one-half days.

GASOLINE FILLING STATIONS were urged to install small radio receiving sets, 200 to 400 kilocycles range, by the Bureau of Air Commerce. Through these sets they could supply motorists with information concerning weather conditions, particularly of importance in the mountainous sections where fogs and heavy rains mean trouble. Hourly weather reports are sent to airplanes from 68 stations maintained by the Department of Commerce, and this would also be of service to motorists.

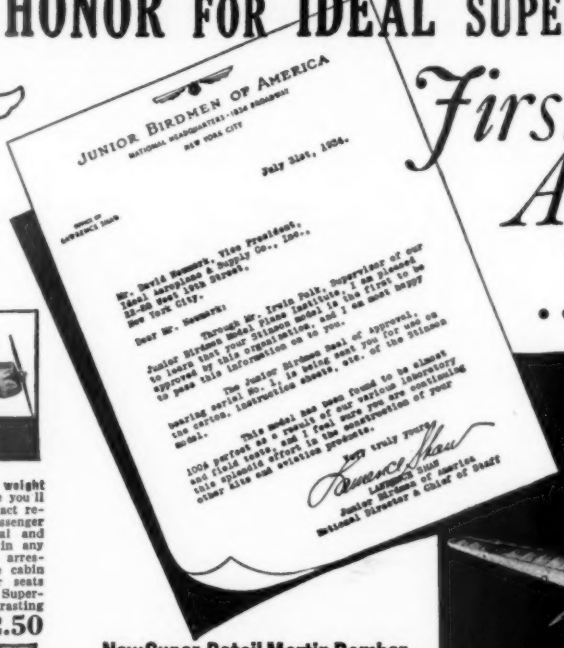
J. D. GRANATH, Chicago inventor, is perfecting his compression control device which has been described in P.A. It permits the development of greater power through the control of the compression and working pressure and has shown very promising results in its present state.

EAGLE AIRCRAFT SUPPLY CO., St. Johnsburg, Vt., is a new advertiser in POPULAR AVIATION. This firm handles a very complete line of airplane supplies and equipment, specializing in high-quality spruce.

WACO
AIRPLANES
"ASK ANY PILOT"
AMERICA'S
OUTSTANDING CHOICE
The WACO Aircraft Company • Troy, Ohio

ANOTHER HONOR FOR IDEAL SUPER DETAIL PLANES

TESTED & APPROVED BY JUNIOR BIRDMEN OF AMERICA MODEL PLANE INSTITUTE SER. NO. ONE


JUNIOR BIRDMEN OF AMERICA
NATIONAL HEADQUARTERS—1834 BROADWAY
NEW YORK CITY

July 31st, 1934.

Mr. David Bennett, Vice President,
Ideal Aeroplane & Supply Co., Inc.,
22-26 West 19th Street,
New York City.

Dear Mr. Bennett:

Through Mr. Irvin Polk, Supervisor of our Junior Birdmen Model Plane Institute, I am pleased to learn that your Stinson model is the first to be approved by this organization, and I am most happy to pass this information on to you.

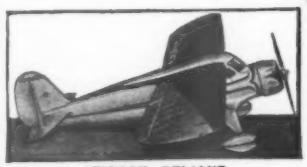
The Junior Birdmen Seal of Approval, bearing serial No. 1, is being sent you for use on the carton, instruction sheets, etc. of the Stinson model.

This model has been found to be almost 100% perfect as a result of our various inspectory and field tests, and I feel sure you are continuing this splendid effort in the construction of your other kits and aviation products.

Very truly yours,
Lawrence Shaw
Junior Birdmen of America
National Director & Chief of Staff

First to be Approved

...by Junior Birdmen



STINSON RELIANT

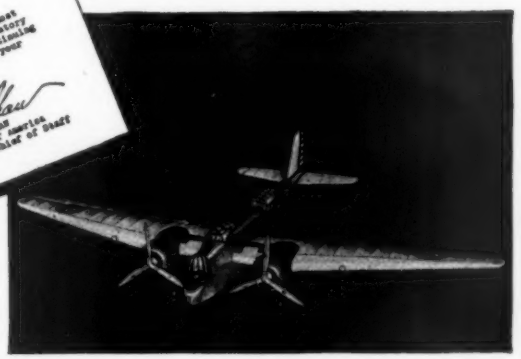
Wingspan 32 5/16", length 21¼", weight 3½ oz., exact ¾" scale. Here's a plane you'll be mighty proud to own and fly. An exact reproduction of one of the latest 4 passenger cabin planes. You'll find more unusual and different features in this plane than in any other. For example—adjustable speed arresters built into the wings, the movable cabin doors, the complete interior with four seats and control column, and all the other Super-Detail features. Colored in bright contrasting yellow and black.
Kit complete **$2.50**

CURTISS GOSHAWK

Wingspan 23⅜", length 16¾", weight 3⅜ oz., exact ¾" scale. You've heard of this beautiful Curtiss Goshawk. Now you can build your own with the most complete kit you ever saw. This snappy little Navy fighter has many more details than you can see in the photo. Everything designed in exact scale of course. Streamlined drag ring specially designed; two detachable blade propellers, and the entire model coated with the new IDEAL high lustre finish, with silver, yellow, red and black coloring. Plenty of material is furnished.
Kit complete **$2.00**

BOEING P-26A

Wingspan 21¼", length 16", weight 2½ oz. Exact ¾" scale. One of the newest, most advanced of all fighting planes. Fast, speedy, with full armament capable of over 240 miles per hour. This flying model is an exact replica of the famous fighter—one that is identical in all but size with its noteworthy big brother. Beautifully colored in olive drab and yellow. All Super-Detail parts included.
Kit complete **$1.75**



New Super-Detail Martin Bomber

Exact ½" Scale

Wing span 34½", length 22⅛", weight 4⅝ oz. This famous big, powerful mystery ship of the Army now comes to you in exact ½" scale, a beautifully designed olive drab and yellow IDEAL Super-Detail Model. Has more new and beautiful features than any model plane you ever saw—one of the most complete flying models ever built. In addition to cockpit-operated controls and other standard Super-Detail features, the MARTIN BOMBER has retractable landing gear, rotating gun turret, movable machine guns, special streamline cowlings, two types of 3 bladed propellers—one for flying and one for exhibition; with removable motor sticks for flying; Rudder and elevator balanced surfaces. New type freese ailerons—all in all one of the finest flying models ever built. Order yours today with the coupon.. **KIT COMPLETE**..... **$3.50**

First to be approved—found to be almost 100% perfect in every detail—the famous IDEAL Stinson Reliant. This big beautiful flying model came away with the honors—and that's the way every IDEAL Super-Detail model is built, to come out on top.

No wonder IDEAL models take the lead. They are 100% scale—laid out by experienced flying men—men who have spent their lives designing and building real planes. That's why IDEAL Kits are accurate, complete, perfect, exact in every detail. That's why you really learn the principles of aviation when you build and fly an IDEAL Super-Detail model.

Whether you build the New Martin bomber shown above, the Stinson Reliant, the Curtiss Goshawk or the Boeing, you get the same high quality workmanship, the same accuracy in detail and 100% scale reproduction with every construction feature of the original duplicated and in the exact proportion, so that the finished plane not only flies beautifully, but it gives you a strikingly handsome, precise and perfect flying model.

BOYS! MAKE BIG MONEY BUILDING PLANES

There is a big demand for IDEAL Model Planes. They are extremely popular for decorative purposes in the home. Sporting goods stores dealing in aviation supplies, drug stores, jewelry stores, and toy stores all want them for display purposes and to place in stock. They are beautiful in windows or on counters, they help to advertise the store and attract attention to the windows.

You can sell finished IDEAL Planes to gas stations dealing in aviation oils; rent or sell them to department stores for special sale or sales in the sporting goods departments. You can also rent or sell them for decorative purposes to aviation associations, lodges, and club rooms. The possibilities for selling finished planes are almost endless.

ILLUSTRATED FOLDER—**Send 3c for the new IDEAL folder showing the latest model IDEAL Planes. It contains valuable information on how you can make real money by building and selling these famous flying models.**

DEALERS: You can make more money with IDEAL products. Write for details of more than 100 model airplanes & ship models

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WHAT THE SUPER-DETAIL KIT INCLUDES:

Everything necessary to build a big, beautiful workmanlike job is included in the Super-Detail Kit. Finest materials only are used in its construction: Sheets of selected plainly printed balsa, strips of various sizes, etc., sheets of silk tissues, cement, both colored and plain dope, propeller shafts, two propellers, motor plate, rubber motor, wheels, cable cord and all other hooks, pulleys, control hinges, eyelets, washers, sand paper, celluloid, reed, wire and other small but necessary things to make the complete model exactly in accordance with the plans and instructions.

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Canadian Model Aircraft, 3007 St. Antoine Street, Montreal.

22-26 West 19th Street, New York, N. Y.

IDEAL AEROPLANE & SUPPLY CO., INC.
22-26 W. 19th St., New York City

Please send immediately the items I have checked below. I am enclosing $..... (West of Denver 25c extra. All planes postpaid.)

Martin Bomber ☐ $3.50 **Curtiss Goshawk ☐ $2.00**
Boeing P-26A ☐ $1.75 **Stinson Reliant Airliner ☐ $2.50**

Folder with information ☐

Please print name.....
Address .....
City ..... **State**.....

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JUST IN TIME FOR CHRISTMAS

OUR

FREE GIFT TO YOU

These 2 Kits:-

Complete! Ready to Build!

(At left)—the well-known S.P.A.D.

(Below)—War fighter NIEUPORT

Regular 75c value. Complete with colored insignia, lacquer, metal props, balsa, dope and plans to build BOTH MODELS.

These 2 kits of famous War-time models will enable you to build lifelike models you'll be proud of. They have been reproduced in perfect detail (1/4" scale) and will provide great enjoyment to old and young model builders alike. These kits are yours and will be sent you FREE with a

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(Continued from page 364)

action has brought a crisis in the whole question of governmental aviation affairs and has thrown the problem into the crux. Some profess to feel that usefulness and power of combat planes in a possible next war has been placed at stake and that the whole question of military development of airplanes, which, of course, is closely bound up with the fortunes of civil aviation, is hanging fire.

Major-General Foulois, who began flying twenty-five years ago with the Wrights in their early ventures, and who has been an important cog in the nation's air affairs, finds himself now reduced to the point of command of Army air schools and supply depots. "Fortunes of war," the general is said to have remarked when he learned of the move.

From what is known of the make-up of the President's special commission which heard Mitchell and which is extending its inquiry to take in the broadest possible scope in connection with the question, an expanded and enlarged air force and an ambitious aviation program is likely to be recommended. It is not known at this time, however, exactly what this commission may report.

Mitchell, in addition to his extremely sensational charges and general testimony, had one thing to tell the commission which most of the public missed entirely. He advocated that the government itself purchase most or all of the worth while patents pertaining to the aviation situation and hold them in the public interest. This would give the government lasting and complete control of developments.

He also declared strongly in favor of a substantial system of subsidies for commercial lines, although he stated their policies with reference to air stocks would have to be reformed. He advocated complete abolition of the National Advisory Committee for Aeronautics, and would transfer its functions to a centralized air administration agency.

Mitchell is still a staunch backer of the plan for a unified air force as national policy, the advocacy of which led to his resignation from the service eight years ago. He lost no opportunity to insist on the soundness of this plan this time when he appeared before the committee.

Officials of the War Department were up in arms over the criticism which greeted the order following out the recommendations of the Baker committee. They asserted that while they could not officially say so, there was a good chance that the new move would indirectly result in the formulation and development of the largest fighting air force ever marshalled by the United States government.

An air administration, such as advocated by Mitchell, would consist of three separate and distinct branches, with a director of its own. One branch would deal with military aviation. One would deal with civil aviation. One branch would deal with engineering and research. Naval aviation, under his plan, would be left in somewhat the present status.

"Civil aviation in the United States," declared the militant General Mitchell, "may be definitely superior to civil aviation in other countries in certain respects. But I am sure of one thing: military aviation is not superior to military aviation in any other country.

"It is not even equal to it in many countries on such points as speed, cruising radius, altitude potentials, and engine development of the planes. Compared with other nations, the air outfits of our Army are not as efficient as they were eight years ago. I am referring now not simply to single, isolated cases or equipment or performance, but to both equipment and performance generally.

"Of course, our air corps is better now than it was eight years ago, but the margin of foreign supremacy is greater now than it was then. If I had to fight some of these people I just do not know what I would do in our present situation. Certainly we would have to get some of our engines and instruments abroad to keep up with them. Of the 600 Army airplanes which gave a coast-to-coast display two years ago, not one ship was fit to combat with another power. The Baker air committee and the Army air corps are still thinking of the same things we had in the Argonne—and not even as much as that.

"All our present military aviation equipment is good for is fooling around with the infantry, flying around close to the ground in formations where they can be seen. What is needed are planes capable of flying at an altitude of 35,000 feet and capable of a speed of 400 miles an hour; planes that can shoot from sides and tail as well as the front; planes carrying smoke and gas in their tails to hold off the enemy."

He asserted that America's most dangerous enemy is Japan. He said detailed plans should be made which could be used in time of war for protection of the greatest cities, against attack from Alaska on the part of Japan. He urged construction of dirigibles which, he asserted, "competently handled" could destroy Japan in two days.

However, the good General did not explain just how such a tremendous appropriation could be obtained which would amount to approximately $8,000,000 per dirigible thus employed. Neither did he explain just how this fleet of slow-moving airships could be made immune from the attacks of a swarm of military airplanes.

A great deal of other sensational testimony was heard by the commission. Some of it involved the question of the value of gigantic lenses which might concentrate the sun's rays on cities of the enemy and destroy them by fire.

END

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AFTER ALL There Is No Substitute for QUALITY

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Colored Jap Tissue	Wing Adhesive	Cement
		Rubber
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FULL-SIZED PLANS, building instructions and everything to build a complete model.

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VAUGHT CORSAIR 15" Wing Span

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Curtiss Swift
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Puss Moth
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These new models are sensational in their flight performance. Flights over 200 feet are GUARANTEED with these snappy, LARGE, long-distance flyers, with their slow-winding propellers and bright colors. These models are the choice of the most critical model builder and judge.

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LOCKHEED SIRIUS 15" Wing Span

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Guarantee—If You Are Not Satisfied —Your Money Will Be Refunded.

FREE SPECIAL!! With every supply order amounting to $1.00, we will give, absolutely FREE, a pair of celluloid 1¾" Wheels. Do not count postage as part of the order.

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The Lindy Sensation Tingmissortog

Solid Wood Replica

15" WING SPAN

The Colonel himself would be delighted with this replica of his history - making Lockheed Sirius Monoplane. A beautiful decorative display model for the radio, bookcase or den.

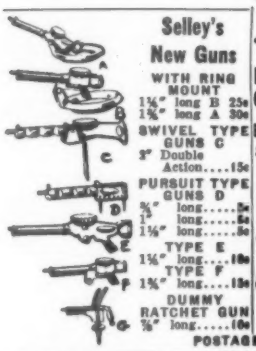
COMPLETE KIT $1.25 POSTPAID

BAT 18" Wing Span

FREE 5"x7" photo of Col. and Mrs. Lindbergh flying this plane, free with TINGMISSORTOG KIT.

Pedestal Base

Black lacquered base for scale models from 10" to 24" wing span at....75c



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WITH RING MOUNT
1¼" long B 25c
1¾" long A 30c

SWIVEL TYPE GUNS C
3" Double Action....15c

PURSUIT TYPE GUNS D
¾" long....5c
1" long....8c
1½" long....8c

TYPE E
1¼" long....10c

TYPE F
1¾" long....15c

DUMMY RATCHET GUN
⅞" long....10c

POSTAGE 3c EACH

Die Cast Bombs and TORPEDOES

13/16".....8c
1¼".....10c
3" Torpedo...15c

COWLS—Span Aluminum

Dia.	Drag Ring	Open Face	Closed Face
1"	15c	15c	15c
1⅛"	18c	18c	18c
2"	20c	20c	20c
3"	28c	28c	28c

Postage 6c

PICTURES
ON BRISTOL BOARD
2¼" x 4¼"
of AUTHENTIC AIRPLANES

24 ARMY.....25c Set
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RUBBER TIRED WHEELS

Aluminum Disc Rubber Tired Tail Wheels
½" dia.....5c ea.
⅝" dia.....6c ea.
¾" dia.....7c ea.
⅞" dia.....8c ea.
1" dia.....9c ea.
1½" dia.....10c ea.
1¼" dia.....11c ea.

Balloon Tire Alum. Disc
1½" dia.....25c pr.
1¾" dia.....28c pr.
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Bal. Tired Col. Disc Wheel
1½" dia.....30c pr.
1¾" dia.....33c pr.
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SEND 5c FOR CATALOG

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1" dia.....18c pr.
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1 3/16" dia...30c pr.
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2½" dia.....60c pr.
3" dia.....$1.25 pr.
4½" dia....$2.00 pr.
7" dia....$2.50 pr.

Swivel Joint Fork and Axle
½ up to ⅝" wheel 10c
¾ up to ⅞" wheel 15c

Postage 3c Pair—on Rubber Tired Wheels, 4c Pair

PROPELLERS

2-Bladed	3-Bladed	2-Bladed	3-Bladed
3¼".....25c	4".....35c	1½".....10c	1½".....15c
4".....30c	4½".....45c	2½".....15c	2½".....20c
4½".....35c	5".....50c	3½".....20c	4".....30c
5".....35c	5½".....60c	4".....25c	4½".....40c
5½".....40c	6¼".....70c	4½".....25c	5".....45c
6¼".....40c	7".....80c	5".....30c	6".....60c
7".....55c	8".....90c	5½".....35c	7".....70c
8".....65c	9".....$1.00	6".....40c	8".....80c
9".....75c	10".....1.10	6½".....45c	9".....90c
10".....85c	11".....1.25	6¾".....50c	10".....$1.00

Props. can be had up to 24 in. dia. Postage 6c each.

WORKING BRASS TURNED

Take-up	Long	Toggled Plain End	
½"	⅝"	.25c	.30c
¾"	⅞"	.30c	.35c
1"	1⅛"	.30c	.35c
1⅛"	1⅜"	.50c	.55c

DUMMY TURNBUCKLES
¼".....10c each
⅜".....10c each
½".....10c each

DUMMY MOTORS
New Detailed Cast Motors
1" dia., 9 cyl.....30c
1⅛" dia., 9 cyl.....50c
Postage 3c Each

IMPORTANT—Minimum order, 50c. Add postage on all items but if over 15c on less than $1.50 order add only 15c. Orders over $1.50 add 10%; west of Denver 15%.

SELLEY MFG. CO., INC., Dept. 412
1377 GATES AVENUE, BROOKLYN, N. Y.

Airy Chat

(Continued from page 346)

maximum flying hours for PILOTS, especially after an "expenses-paid" operator-junket trip.

There is no doubt that aviation requires regulation. ALPA (Air Line Pilots' Association) believes that if the opinions of President Roosevelt and other competent leaders were followed, the entire affair would be rapidly adjusted.

Maybe, some day, there will be an aviation committee that has a member that is a REAL pilot, who will not have the notes for his speech in a bank book, and who will be permitted to tell as a result of his FLYING experience, such aids that might increase public safety.

And that's hitting them off to a "T"! Remember that this is an expression made and believed in by an association of commercial pilots who daily fly passengers and mail along our American airways. We only wish, ALPA, that you would set this editorial in larger type and nail it on the billboards where the public at large could read it.

* * *

WHAT'S the matter with the famous California climate? Are they running out of air on the coast or are they only looking for a superior grade of atmosphere? Recently, United Air Lines carried ten pounds of compressed air from Midlands, Mich., to Los Angeles.

* * *

AFTER 30 years of trying to break high-speed records with airplanes and breaking necks along with the records, we wonder why these competitive-minded guys don't try things from another angle. Why don't they have a slow-speed contest, suitable for happy landings in cow-pastures?

* * *

BUT, on second thought, perhaps the low-speed contests would be even more dangerous than the high-speed variety. Out of ten entrants, we could depend upon at least four of the boys stalling their ships while five or six feet off the ground. And that would not be so hot, either.

* * *

THE ANVIL CHORUS, or the hammer and chisel boys, let out a roar over last month's issue that could be heard for fifty miles around. They demanded the reason for the omission of the Kontact Klub Kolumn.

Well, the explanation is short and sweet. We didn't receive enough notices last month to make the column worth while. It goes this way, sometimes we will have an overwhelming bunch of contributions one month and none at all on the following month.

* * *

TRADE PAPERS, class magazines, or what you may call 'em, are the life blood of any industry. They have never been given the credit that is due them for passing out useful information at a nominal cost. For the younger members of the industry and the apprentices, the trade journals are veritable universities in their craft and, for the older members, they afford a means of keeping in touch with what the other fellow is doing and thinking.

If it were not for the trade publications, there would be mighty little progress in the technical end of an industry —or in the commercial end either, for that matter. Readers who write in to a magazine for information or advice are receiving real merchandise worth many times the cost of a subscription. The papers have always been a clearing-house for news, views, ideas, and data of all sorts.

And yet, of recent years, the trade-press has been receiving less and less support from the group that it represents. They even predict that it may become extinct. This is not so apparent in aviation as it is in other industries that are rapidly becoming negligent in this respect, notably in the machinery and engineering fields.

There is a growing tendency for the various societies and trade associations to substitute their house-organs for the conventional old-time trade journals, thus permitting complete control of a field by a small group of men. In such cases, no opinions can rule except those members of the learned societies, who in most instances have a large heavy axe to grind. This deters progress and development.

* * *

THE OTHER day, an argument started up in our office concerning the relative merits of welding and brazing. The party to the affirmative pointed out that brazing does not destroy the strength of the steel tubing in the vicinity of the connection and that it is more certain than welding. Those in the negative division claimed that a weld is less subject to crystallization and fatigue than a brazed joint. Wonder who's right and who's wrong in this debate?

* * *

THERE IS a national society for the promotion of the metric system in America. For many years they have been spreading propaganda to the effect that the metric system is superior to our present English system of units.

Now, to change over to the metric system would be nothing short of a calamity. It would mean the junking of billions of dollars worth of tools, drawings and other equipment, involving industry in chaos. And all for no good reason. There would be no technical textbook that would not require rewriting and the many conversions would involve endless trouble.

The metric system offers no real advantage over our present system, providing that we stick to one English unit at a time such as the inch, pound or gallon and do not attempt changing these units into feet, miles, ounces or pints.

For example, if all measurements were given in inches instead of later converting them into feet and inches, the English system would be as simple as the metric. Thus, if we give a measurement as 1,500.87 inches, it is no more complex than the European method of quoting 1,500.87 mm. Fractional parts of inches given as decimals instead of vulgar fractions would further simplify the method.

* * *

I WONDER why they call these new sausage-link railroad trains "streamline trains"? They certainly do not resemble any streamline body that I have ever seen. Their only point of merit is a smooth outer skin without ventilator monitors. According to my understanding of a streamline body, it has a large diameter bluff entering end with a thin tapered trailing end. The new cars do not answer this specification—so why "streamlined"?

* * *

EVERY MONTH we receive a bunch of letters from young men asking us if there is any way of getting into aviation without money. They are real enthusiasts who would work for nothing except their rooms and meals. But we are sorry to say that we have never heard of anyone getting into aviation without some cash on hand. There have been some cases in years gone by where a young fellow could earn his way by working for a pilot, but those times have long gone past.

* * *

SAY, fellows, if you've a postage stamp or postcard to spare, we would like to have your opinion on Steve O'Connor's regular column. It is interesting, we admit, but would you rather have something else to fill the space that is more interesting?

* * *

AFTER a lapse of a year, the clever little West Coast aviation paper, "Tale Spins," has again made its appearance and in new form. Mighty glad to see you back, "Tale Spins," we wish you all sorts of luck and prosperity. And this is from the heart out.

* * *

WELL, the old clock says it's closing time, and so home to supper. See you later.

J. B. R.

Dealers! Jobbers!

Follow the Duncan Line to new profits. Increase your model airplane business by stocking Kits, Plans and Parts designed by Joe Ott, nationally-known model authority. A new deal on balsa wood and other materials. We sell to jobbers and dealers only. Standard discounts. Write now. No obligation.

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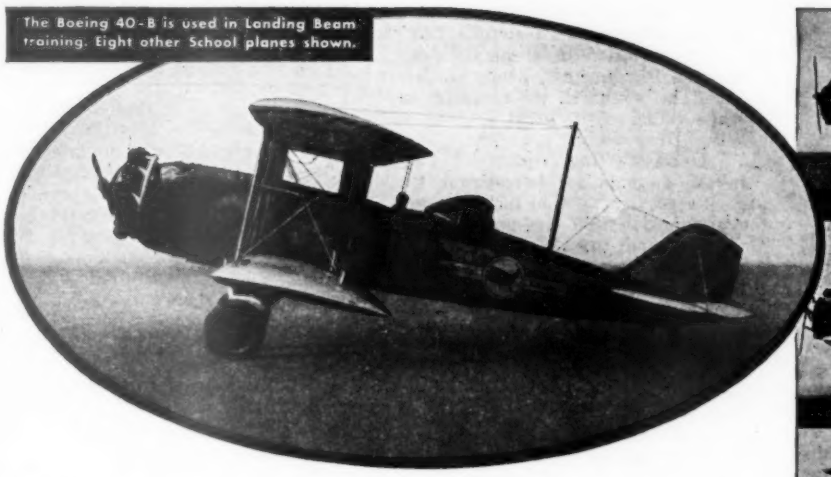

The Boeing 40-B is used in Landing Beam training. Eight other School planes shown.

I. Boeing 203 Trainer, 2-place.

II. Boeing 81 Trainer, 2-place.

III. Stearman Trainer, 2-place.

IV. Boeing 203-B, 2-place.

V. Stinson, Junior, 4-place.

VI. Boeing 40-C, 2-passenger transport.

VII. Hamilton monoplane, 8-place.

VIII. Tri-motored Ford Transport.

Boeing students now have LANDING BEAM instruction

FOUR years ago, Boeing School introduced instrument flying in a hooded cockpit as part of the regular curriculum.

Now it rounds out instrument training by the addition of *landing beam* instruction. The plane adopted for this work (Boeing 40B, shown above) is used jointly by Boeing students and United Air Lines pilots.

This direct interchange of experience and facilities with America's most experienced air line, through a side-by-side location on Oakland Airport, is largely responsible for Boeing School's leadership in all departments of flying and technical instruction. Facts flown out of 70,000,000 miles of air-transport operation are put to practical use here, in the laboratories, shops and class rooms.

United Air Lines maintains only one school. The Oakland Airport was chosen as its location because of all-year flying weather, economical living conditions, and the opportunity to observe the day-and-night flying and servicing of the United fleet.

Send for an up-to-date Bulletin, describing newly enriched courses, living conditions, school equipment, etc. The coupon below brings your copy.

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- ☐ BOEING AIRLINE PILOT
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- ☐ SPECIAL AIRLINE PILOT (*For Transport Pilots only*)
- ☐ AMATEUR PILOT

Name _____ Age _____

Years in High School _____ Years in College _____

Address _____ Phone _____

City _____ State _____

Parasitic Drag

(Continued from page 376)

Given: An airplane weighing 3,000 pounds.

To find: The parasite drag at 100 m.p.h.

Solution: W/1,000 = 3,000/1,000 = 3.

Parasite Drag Coefficient =

(3 × .0068) + .01 = .0304

V = 100

V^2 = 100 × 100 = 10,000

Parasite Drag =

.0304 × 10,000 = 304 Pounds Drag

This, as previously mentioned, represents an extreme case which we will for convenience call case (A), and the equation will have to be corrected for other conditions. The corrections must be left largely to the designer's discretion. The following correction factors will, however, be of considerable assistance:

(B) Well streamlined biplanes or externally braced monoplanes— Correction Factor = .75

(C) Exceptionally clean externally braced monoplanes— Correction Factor = .50

(D) Cantilever monoplanes with retractable landing-gear— Correction Factor = .20

Condition (D) clearly represents the ultimate in streamlining whereas the uncorrected formula (Case A) would be applicable to biplanes where little attention had been paid to fairing.

By the use of this data we may decide on the top speed we wish to attain with our design and easily determine the horsepower the engine must supply to the propeller in order to overcome the drag. To do so we must necessarily add the drag of the wing to that of the structure. The equation for wing drag is as follows:

Wing Drag = C_d × .00256 × V^2

In the case of modern airfoils, however, the variation in minimum drag coefficients is not great, hence our error will be slight if we consider an average value.

Wing Drag =

.00004 × Wing Area × V^2 (3)

In the formula for horsepower the propeller efficiency will be included with the assumption that the propeller diameter is equal to:

Propeller Diameter =

100 V/r.p.m. (4)

This formula, although extremely simple, will be found to give excellent results.

The formula for horsepower then becomes:

Horsepower =

.0034 × (Parasite Drag + Wing Drag) × V

An attempt will be made to clarify this formula with an illustrative example:

Given: An externally braced monoplane of exceptionally clean lines, weighing 1,200 pounds, with a wing area of 110 square feet. It is desired to attain a maximum speed of 115 m.p.h.

To Find: Parasite coefficient, parasite drag, wing drag, total drag, horsepower.

Solution: This obviously will fall in Case (C) and therefore the correction factor will be .50.

W/1,000 = 1,200/1,000 = 1.2

Parasite Coefficient =

.5 ((.0068 × 1.20) + .01) = .00908

V^2 = 115 × 115 = 13,225

Parasite Drag =

.00908 × 13,225 = 120 Pounds Drag

Wing Drag =

.00004 × 110 × 13,225 = 58 Pounds Drag

Total Drag =

120 + 58 = 178 Pounds

Horsepower =

.0034 × 178 × 115 = 70 h.p.

Therefore it will be necessary to use a 70-horsepower engine in this airplane and assuming that the engine will develop its rated power at 2,000 r.p.m. we may decide on the propeller diameter:

Diameter =

100 V/r.p.m. = 100 × 115/2,000 = 5.7 Feet

END

Aviation Law

(Continued from page 366)

value, with the result that the government could never collect the penalty and the law would be without force.***

"Ordinarily, the word 'penalty' is regarded as being substantially synonymous with the word 'forfeiture', both indicating a punishment, and no reason here appears for making a distinction. While the statute does not in terms declare a forfeiture, still the enforcement of the penalty lien, in effect, operates to bring about such a result. If this was not intended the remedy must be sought from Congress, not the courts.***

"Nor are we here dealing with an innocent owner who has been injured by the act of some third person, without his knowledge or consent. Here the owner was in possession and command of the aircraft; he was the one who violated the regulation. True if the penalty lien is adjudged paramount, a hardship falls upon the mortgagee; but the mortgage was entered into after passage of the Air Commerce Act and the mortgagee knew, or should have known, of the provisions of the act.

"In the circumstances, the Air Commerce Act became a part of the mortgage. The airplane was permitted to remain in the possession of the owner without restriction upon the use and the mortgagee having left it within the power of the owner to violate the law cannot now complain.***

"Judgment of the lower court is reversed, and cause remanded, with directions to enter judgment granting the penalty lien priority to the lien.

The foregoing decision appears to be one of first impression on the precise question involved. The case was carefully reasoned by the court, and the holding unquestionably follows the great weight of authority in analogous situations. This authority taking the position that the penalty, or forfeiture lien, provisions of statutes of this character are superior to other liens upon property proceeded against.

In the light of which, it is clear that a plain violation of the Air Commerce Act may entail serious financial loss.

END

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all with printed out wood

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We claim for this model the distinction of being the finest and most complete authentic flying model on the market today. Even exhibition models could not outclass this new beauty for external appearance—and she flies very well, too! Colored the usual yellow and olive drab of the Army with the beautiful color marking of the Selfridge Field Squadron of its characteristic black and white; with black lettering and red striped top wing, along with the red, white and blue insignias, and the "super" authenticity, this model is taken out of the model building class of hobby work into one of almost scientific precision duplicating. The model should make a 100% wind-tunnel model. Every possible detail, wing ribs, stringers, etc., reproduced. Span 23¾", length 16¾", weight 4.9 oz. Complete Kit SF-21B **$3.25**

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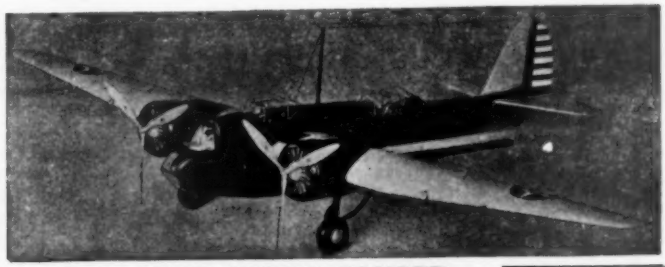

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An authentic steady flying beauty so colored that it looks as though it were drawn right from the ranks of one of the famous German "Flying Circuses." Wings taper beautifully, new feature control movements (not from cockpit), scale propeller, authentic spandau guns (you make all). Colored international orange, green, white, black details. Span 21½", length 17⅛", weight 3.5 oz. Kit No. SF-15B . **$2.95**

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BOEING P12-E BELOW

One of the prettiest of all army fighters. An excellent flying model. Span 23½", length 18⅝", weight 2.2 oz. Colored yellow and olive drab, with beautiful red and yellow trimmings. Kit SF-8C, only **$2.85**

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BOEING 247

This giant has a span of 35⅝" and a length of 38⅛", and is nothing less than a wizard for flights, with its two motors powerfully pulling. It is entirely gray colored and weighs 16 oz. The redesigned model has all curved wood printed out (an enormous quantity) with data for more authentic building and appearance than heretofore, with "filled-in" fuselage, balanced controls, etc. The thoroughly engineered drawing of four large panels (17x44"), each contains accurate modeling information and over 16 oz. of liquids, dope, cement, etc., contained within each one of the new giant Kits. We now offer a guaranteed mailing service without the questionable express charges, so we quote you prices shipped post free, to your address **$8.50**

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HOWARD RACER "IKE"

Information on this design is supplied both as the four or two wheel "Ike" and the two wheeled "Mike." Flies and climbs beautifully. Span 15⅝", length 13⅞", weight 1.5 oz. White with black details, lettering. Kit SF-42 only ..... **98¢**

NAVY BOEING F4B-3 or -4

Beautiful flying miniature of the masterful fighter now used by the Navy. Exciting to build—thrilling to fly. Capable of fairly long flights. Span 22½", length 15⅝", weight 2.2 oz. Colored silver, yellow and red Kit SF-29 ..... **$2.85**

DOUGLAS O-38 OBSERVATION

Very beautiful and unusually well detailed model. Authentic only as "Cleveland" makes 'em! Span 30", length 22⅝", weight 4.9 oz. Yellow, olive drab, black details. 2 pilot blocks. Kit SF-43 ..... **$3.75**

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Airmeet

(Continued from page 362)

seasoned flyers as well as the curious public. As Dr. Anderson said, between delighted chuckles, "Crazy as that is, it is good publicity for the safety of flying." And it is, you can't be afraid of something you laugh at!

Though the crowds were small compared to the much-publicized national meets, we feel that smaller shows such as this one, where the sportsman pilot plays an important part, are better publicity for aviation. We have one concrete example to offer . . . we took a friend out to the meet (who saw an accident a few years ago and had sworn she would *never* fly) but after a few hours on the upper deck of the hangar watching the busy preparations for the afternoon's performance; listening to the matter-of-fact discussions; meeting many of the flyers, both men and women . . . it was too much of a temptation, she decided to fly then and there!

Herb Anderson and Harold Darr, who are co-managers of the Curtiss-Reynolds field, are to be congratulated, not only for their part in the recent show, but for several other interesting events this past summer. Jean La Rene's endurance flight headquarters have been here all summer. Wiley Post has been making all his test hops in preparation for his stratosphere flight and Dwight Morrow has been test-hopping Steve Nemeth's round-wing ship.

Probably no other airport in the country has a more perfect location, or better hangar facilities. It is ideal for private flying, air-meets and student instruction. The personnel at the field has shifted from time to time, but Mr. Darr as field manager, Dwight Morrow as chief pilot, and Staples as head of the ground crew, are holding the same positions that they did when the port was first organized. And if we may get a bit personal, we might add, "Andy" was our first instructor, though he has had a lot of experience since then flying the mail and passenger planes, instructing TWA pilots in blind-flying, etc. . . .

END

Gliders

(Continued from page 378)

place where a glider could be constructed in your locality.

This way, we will all get together. I have found that, in a city like Chicago, an air-minded fellow may be looking all over town for others that may be interested in building a glider and yet they may live right next door to two or three others with the same idea. So, come on you aviation-starved youngsters, let's cover our wings and take to the air. Write me in care of the national glider movement, POPULAR AVIATION, then keep your eye on the next issue for the results.

END

Steve O'Connor

(Continued from page 370)

of Sir Charles Kingsford-Smith that his Lockheed Altair had some defects which necessitated his cancelling out of the MacRobertson Race? Mark Nevils did public relation work on a good publicity job for John H. Wright and the Curtis Candy Company. Tough about the American balloon pilots who finished tenth and thirteenth in the Gordon Bennett Balloon Races in Poland.

James Ross writes me that Department of Commerce inspector, George Vest, has grounded a lot of glider planes around Chicago lately which he thinks is all right, too. I also hear that Inspector Vest is well again, after having lost his teeth. A good guy and I'm glad he's well. Thanks for your letter, Jim . . . To Irving A. Burgher: You will get the latest right here in the pages of POPULAR AVIATION on the lightplane developments. Thanks for your interesting letter and the pictures . . . To L.S.: Yes, I will be in Miami, Pensacola and New Orleans this winter. At least I plan to . . . To Jim Troy: No doubt you could give a lot of racing pilots a thrill if they rode your fire truck . . . Ralph Ingledew.

De LaSauex, another D. C. inspector, is looking forward to the days when he can retire to his native California and build a home along the building styles of a hangar. Place a weather cone up and put a lot of old worn-out chairs around, you get the idea, and then invite all the boys down to chin and chin and go fishing. He lives near San Diego and I reckon he'll have company.

Was nice to see Jerry Wood, the Ford barnstormer. He says the going is good down in old Mississippi and that he will be back down south after a top overhaul. Also the Jack Vilases of Chicago and Miami are looking well and happy. He was the first fellow to fly across Lake Michigan and some feat, too. At the time it set a record for the longest over-water hop. Does time move? Another guy who doesn't get old is Eddie Nelson.

END

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You will be pleased with this airplane's "sure-fire" performance. Actual recorded flights: Silver, 5 min., 30 sec.; Atwood, 5 min., 5 sec.; Morris, 4 min.; Donahue, 3 min., 50 sec.; Pica, 2 min., 40 sec.; Mix, 5 min., 20 sec.; McDowell, 6 min., 45 sec.; Hebert, 4 min., 30 sec. 26" span. Freewheeling propeller. COMPLETE KIT. Postpaid..... $1.00

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Pioneer Circus

(Continued from page 368)

pilot to take up passengers. Every person that went aloft with this certain pilot would receive a certificate, autographed by him, saying that he had flown with this distinguished flyer. As he was taking up passengers the promoter would ballyhoo his audience into taking rides.

As his line of chatter would begin to fade he would send a stunt man up with a parachute to make a jump, so as to stimulate the interest of the crowd. During the jump all the planes would prepare to take up passengers, the price being about twice that of regular. As this little act took place the planes would circle around the ship with the parachute jumper so the passengers could watch him float to earth from the air.

The job of the promoter was to keep the people interested and not let them drift away! So when his ballyhoo began to slip he would put on another act of the show, such as: plane exchanges, trapeze acts and wing walking. If the show was to be a financial success, the promoter had to be a super salesman with a powerful personality and a good manager with lots of vim, vigor, and vitality.

This was the type of promoter that Mabel Cody had in Curly Burns. So it wasn't long until Doug Davis began to realize that in Mabel Cody he had a worthy competitor.

In the spring of 1926 those two circuses were going strong, each trying to run the other out of business. Mabel had a good show and Doug knew it. Her stunt men and pilots were some of the best in the country, besides that the troupe was well organized and in the hands of Curly Burns it was a dangerous foe. Doug foresaw that if he could persuade Mabel to join him he would have a gigantic show. She would not adhere to such a plan so the only way to accomplish this was to run her out of business and thus show her that the two together would have a much better circus.

He tried to encourage some of the men in her troupe to join him but they all remained loyal to this fighting little dare-devil of the South. As a result a bitter rivalry arose.

If the Cody Circus would book a town for a show, Doug would book one near to this and of course, having a somewhat better show with a little more prestige, he would get the business. On the other hand, Mabel had her way of striking back. If Davis were to put on an extensive advertising campaign, she would drop into the town a few days before he was to appear and in that way take advantage of his advertising.

During this heated rivalry the shows probably reached the pinnacle of success as individual troupes. Month after month the hatred between the two drew more fire, planes were crashed, stunts were made more death-defying than ever, even lives were lost trying to gain the supremacy of the aviation world.

As time went on the Davis show seemed to become a little more popular! So Doug paralleled the Cody Circus to such an extent that Mabel soon became financially embarrassed and was forced to dissolve her troupe.

Doug now had her in his power. She had the choice of either joining him or dropping the show business for good. This true daughter of the South loved adventure, thrills and excitement. Aviation lived in her very heart and soul. She fought the battle to the very end, gamely, with honest courage always keeping in mind the ideals of sportsmanship. Her desire for this colorful life was so strong that she could not resist joining Doug. Her entire troupe joined with her. Soon she realized the power of the two together and it was not long until she and Doug were the best of friends.

With Curly Burns as their promoter and all the iron-nerve men in aviation belonging to their troupe they were destined to become the most famous in history. It was only a short time after this that the Curtis Candy Co. offered them a contract to fly under their name. They accepted and from then on were known as "The Doug Davis Baby Ruth Flying Circus."

END

3 ft. FLYING SCALE A-8 ATTACK **50c** Plus 20c to Cover Postage, Packing and Insurance

After 3 months of experimenting we now offer this 3 ft. A-8 Attack model at only 50c. Weighs only 5 oz. Strong and ruggedly designed. Our test models have made flights of over 400 feet with a duration of 47 seconds from take-off. Order our flying A-8 Attack and get a real thrill

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5 FT. MONOCOUPE (Illustrated at right)
5 FT. STINSON RELIANT
5 FT. HEATH PARASOL

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Also These New 2-Ft. G.H.Q. Kits:

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SOPWITH CAMEL
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MONOCOUPE
FAIRCHILD "22"
AERONCA
FOKKER D8

24" Nieuport 25c

24" Douglas Mailplane 25c

24" Stinson "R" 25c

20" Robin 25c

24" Curtiss JN4 25c

24" Bellanca 25c

Each 2 ft. kit contains full-size plans with instructions, all ribs, formers and curved parts clearly printed on best grade balsa, special endurance rubber bamboo where needed, cement, dope, wire, finished ready-cut wheels, tissue, nose block, spinner block, and balsa strips cut to size. Only the best grade materials are included.

Yessir!

Real full-size 5 ft. Flying Scale Models for only $1.00 (Plus 35c postage or 50c west of Denver). Each of these new G. H. Q. Giant Model Planes contains full-size Plans, all ribs, formers and curved parts clearly printed on best grade Balsa. Large bottles Cement and Dope, different colors Japanese Tissue, 50 ft. Special Endurance Rubber, finished Ready-Cut 3" Wheels, Wire, Balsa strips cut to size, Washers, and . . . Movable Controls, shock-proof Landing-Gear, Scale Details, Lettering, Numbering and Insignias, Flight Log, etc.

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G.H.Q. MODEL AIRPLANE CO
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Model Dept.

(Continued from page 379)

the landing-gear struts, follow plan carefully and you will have no trouble in the construction of same. The wheel spats are built up in three separate sections and carved and sanded to shape. The landing-gear may be built with or without the shock absorber assembly.

CONSTRUCTION OF WINGS

Cut all ribs from 1/32-inch sheet balsa. Lay a sheet of waxed paper on the plan and pin leading and trailing-edges and center spar in position. The ribs are now placed in an upright position in their proper locations and cemented. Make wing tips as shown on plan from 1/16-inch sheet balsa. We recommend this type of wing tip, as it is far simpler to construct and neater in appearance.

The ailerons are now built into the panels. Ailerons will eliminate the need for building "wash-in" into the wing. We recommend that you build your model with all movable controls. as you will need these to control your model under flight. Aluminum hinges are cemented into position after wings, etc., have been covered with tissue.

TAIL GROUP

This is made entirely of balsa and is constructed upon the plan. Cover each part separately with tissue in much the same manner as the wing. Aluminum hinges are cemented into position after framework has been completely covered, so that the tissue will be taut.

COVERING FUSELAGE AND WINGS

In covering fuselage cover in long narrow strips, from front to rear, as this is the only way in which a smooth covering job will be obtained. When completely covered, shrink tissue with a coat of water, when thoroughly dry, give two coats of clear dope. The wings, etc., may be covered with larger sheets of tissue, shrink and dope in same manner as fuselage.

FILLETS

Fillets for the wing panel are now carved and fitted to lower part of fuselage. The fillets for tops of landing-gear struts, elevator and rudder are now carved and sanded to shape. Make sure they have the proper fit before final assembly.

FINAL ASSEMBLY

The finish on the model will be greatly improved by giving it three or four coats of banana liquid so that it will have a glossy finish when painted.

END

Aero-Sportswoman

(Continued from page 362)

test several months back, is made to the pilot who lands in the greatest number of different airports during the month. The prize is one of those good-looking sport hats designed by Amelia.

The North Central Section lost one of its most loyal and active members when Clayton Patterson moved to Charlotte, North Carolina, recently. Mr. Walter C. Patterson, Clayton's flyer-husband has been transferred from the Chicago district and made manager of the Ford Motor Company's branch at Charlotte. The Pattersons are both enthusiastic flyers and we hope that the 99ers and QB's in that part of the country give them the proper welcome—for we *realize* how much we are losing in Chicago.

END

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Performance

(Continued from page 376)

structurally and will weigh more for equal area and not give as superior performance as the monoplane. If cost enters into the matter, the initial construction cost will be higher but hangar rental will be lower than the monoplane. It is a matter of personal choice.

A serious mistake of biplane design commonly made, is to use too low an aspect ratio. Nothing under 7.0 should be considered. While this will no doubt entail thin wings, remember the biplane is taken as a whole truss with the top and bottom members acting in unison. Visibility and drag can be improved by carrying the top wing downward similar to the B-J P16 fighting airplane or the Akron Fighter.

Both upper and lower wings can be "gulled" to the fuselage as well. Provided the gap to chord ratio is over 1.1, there is little to be gained by the use of an increased top chord. With wings of both equal span and chord, the ailerons can be placed on the lower surface and effectively operated, and eliminating actuating struts to increase drag. By this arrangement torque tubes can be part of the aileron spars themselves. This all makes for light weight.

Cantilever wings can effectively be used in the "gull" form. This will result in drag reduction as well as a good strength to weight ratio. Gull-wing construction will necessitate considerable attention to the structure and spar arrangement. In tapering wings of this sort, the spars should be spaced at 15 and 60 percent, of the major chord or wing root. The proper amount of sweepback can be laid out, preferably about 2 degrees, which will improve directional stability and not hinder the top speed.

The method of arrangement, whereby the spars are run parallel in a tapered wing, is poor practice since toward the tip, the spar section must be changed and lightened, to suit the diminishing airfoil toward the wing tip.

After the spars are located on the major wing root sector, they should then converge toward the wing tip at 15 and 60 percent. This method is the strongest and best method of spar position recommended in airplane construction.

After all, the flying qualities of an airplane are dependent on good wing construction. The wings should be strongly and cleanly built and finished. Proper structural allocations will determine the strength and to some extent the drag. A happy medium being, where the strength to weight ratio is high and the lift to drag high as well.

Lightplanes offer unlimited opportunities for various aerodynamic combinations. The flying wing, cantilever or braced, is certainly worth trying, as are the gull wings. While the stability may be somewhat more complicated to

work out than the high-wing parasol, the coordination of the center of thrust, lift, resistance, drag, gravity, and center of pressure, will compensate by increased performance. Stability, after all, is a mechanical problem and can as easily be worked out for one system as another.

Speed can be calculated for maximum, by taking the factor 150, times the cube root of horsepower, divided by the wing area. For a ship of the lightplane class of rough external construction the speed factor must be lowered to 130. Therefore we can see from this that low drag is important to secure high top speed on limited power. Lightplanes land at about 30 m.p.h.

Since five or slightly more miles per hour is hardly noticeable, a slight increase in wing loading is advisable to help boost the top speed. A loading of 6 pounds to the square foot, not only gives a better flying ship and smoother in rough air, but one that will actually land only a trifle faster. For lightplanes 6 pounds seems the highest limit in place of 4.0 to 5 we use today. Landing speed is figured by taking the square root of lift, times weight, divided by the area, times the lift coefficient of the airfoil, at maximum angle of attack.

All of these details must be carefully calculated and, if possible, should be plotted out on a graph for different speeds so that the relative quantities can be more clearly understood. Various wing sections should be plotted out in this way.

If we are to keep step in the lightplane field to the trend of higher performance it is inevitable we adopt some of the modern ideas. The ideas proposed are not radical or difficult or impractical. They are sound lessons learned from commercial practice. Surely their advantages in flying and performance will be good enough to use them in future construction.

END

Wing Flutter

(Continued from page 372)

with a view to increasing the torsional rigidity of the wing.

The tests furthermore brought out that the tendency to flutter was quite sensitive to a change in the angle of attack. The airfoil began to flutter at an angle of attack of —2° at a windspeed of 40 m.p.h. The flutter was stopped by reducing the angle to 1½°.

By increasing the windspeed to 40½ m.p.h. flutter was started again. Assuming the wave-length of the aerodynamic impulses to remain the same, it seems most remarkable that a slight increase of a little over 1 percent in the airspeed should be sufficient to revive the flutter, yet a series of twenty observations all showed the same result.

The wing was provided with an extention trailing edge of pliable material. By bending the trailing edge down and thus increasing the aggregate camber of the wing, flutter was found to occur at 30 m.p.h. for an angle of attack of 0°. By bending the trailing edge up, and thus contriving a reverse camber, flutter was observed only after a windspeed of 60 m.p.h. was obtained. The logical inference would be that this was due to the shifting of the center of effort; the report (Air Corps Information Circular No. 608), however, states that it was found that the travel of the center of pressure does not control flutter to any great extent.

The possibility suggests itself that the reverse camber, besides lowering the aerodynamic lift and thereby reducing the torsional and bending loads on the spars with an attendant decrease in deflection, also had the effect of washing out or blurring the aerodynamic impulses. It should be noted that the frequency of a spring is inversely proportional to the square root of the deflection; the natural frequency of the wing, therefore, is inherent and immutable. The only explanation left, then, is that the reverse camber was interfered in some way with the full amplitude of every other aerodynamic impulse, the number of active impulses per unit of length at 60 m.p.h. being thus the same as at 30 m.p.h. for full camber.

Flutter in bending in actual airplane wings causes the wings to flap up and down. This flutter was found to be independent of torsional flutter and could in most cases be ascribed to some outside cause, such as an unbalanced or loosely installed aileron. Such flutter, however, may easily induce a sympathetic flutter in the main wing-structure when the frequency of the vibrating aileron approaches the natural frequency of the wing, and may then produce very unfortunate results.

As torsional flutter was found to occur most readily at zero lift and at the burble-point it is obvious that any excessive torsional flexing of the wing at the tip will lower the velocity at which flutter commences. The coefficient of rigidity of the wing may not always be the same for every section, on account of variations in its internal structures and the natural frequency in torsion may therefore not be consistent from tip to root.

This would modify the amplitude and frequency of the oscillations to a considerable extent, and produce through interferences a condition in which the wing may be subject to alternating periods of total quiescence and of violent flutter, a condition which is perhaps even more undesirable.

The best advice that can be given for wing flutter is not to have it, and this can be fairly successfully contrived by a judicious distribution of mass, elastic axis and center of effort, and by keeping the natural frequency in torsion as far above the natural frequency in bending as is consistent with design and strength requirements.

END

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Eugene Vidal

(Continued from page 358)

and 1,500-meter run) at the Olympic Games in Antwerp.

In 1920, after two years in the Engineer Corps, he transferred to the Air Service and learned to fly at Brooks and Kelly Fields. On his first solo flight Vidal had a most unusual type of mishap.

When his instructor told him to get into the training airplane alone and take-off for a flight, Vidal naturally was thrilled. Also he was nervous and very anxious to make this flight a success. Leaving the ground he gripped the stick a little more tightly than was necessary, and fastened his eyes on the horizon as that was the only way he knew to keep the plane in level flight.

Soon after the take-off the engine began to sputter. His head jerked to the left so that his gaze fell upon the handle of the old-fashioned pressure pump of the plane's fuel system. In a flash his left hand went forward toward the knob of the pump handle, he gave it a tremendous jerk—and pulled the whole instrument board out into his lap.

Vidal had made his first solo flight and first forced landing within ten minutes of being in the air.

Finishing the primary and advanced courses, Lieutenant Vidal was awarded his wings as an airplane pilot, and then was detailed to West Point as an instructor in aeronautics and athletics coach, the first Air Corps representative at the Academy. With him went Mrs. Vidal, whom he married in 1921. Before her marriage Mrs. Vidal was Miss Nina Gore. Her father is Senator Thomas P. Gore of Oklahoma.

In 1926 Vidal resigned from the Army, lost his money in Florida real estate, and began to coach football at the University of Oregon. Two years later he went to work for Transcontinental Air Transport. With T. A. T. Vidal moved from one department to another as often as his employers would transfer him, learning the business thoroughly, and finally advancing to assistant general manager.

Lost in the shuffle of a merger, he joined with Paul Collins, another former T. A. T. employe and veteran air mail pilot, in planning an airline service of a type which both had long dreamed of operating: a short route with high passenger traffic potentialities, and airplanes operating at frequent intervals.

Vidal and Collins sold this idea to Nicholas and Townsend Ludington, and chose the Washington-New York run as their territory. Amelia Earhart, who had handled publicity for T. A. T. as a fellow worker with them, joined the Ludington Line staff in a similar capacity. Despite the fact that there already was a passenger line between the two cities, the Ludington Line, with plane service "every hour on the hour," attracted the patronage and earned a profit. In 1932, Vidal, Collins, and Miss Earhart withdrew from the company and soon afterward it was absorbed by the rival line.

Several months later came the announcement by the White House of new appointments in the Aeronautics Branch (the name at that time of the present Bureau of Air Commerce).

The office of Assistant Secretary of Commerce for Aeronautics was changed to Assistant Secretary of Commerce, with supervision over all of the department's transportation bureaus. Three Assistant Directors were appointed: Eugene L. Vidal, for Air Regulation; Rex Martin, for Airways; J. Carroll Cone, for Aeronautic Development.

In October, Vidal was selected by the President to become Director of Air Commerce, an office contemplated at the outset but not filled until Vidal's elevation to the post. (Although the change in the Bureau's name and in some officials' titles was not made until July 1, 1934, these new titles will be used here to avoid confusion.)

Immediately, he reorganized the Bureau with two principal divisions, Air Navigation and Air Regulation. Functions formerly assigned to the Aeronautic Development Service were divided between the two new divisions. Mr. Martin was assigned to the office of Assistant Director of Air Commerce in Charge of Air Navigation, and Col. Cone was designated Assistant Director of Air Commerce in Charge of Air Regulation.

Even before he had been named to head the Bureau, Vidal was organizing in his mind the plan of action that he thought would have the best chance of success in promotion and regulation of civil aeronautics, but he did not talk about all his projects right away. After his appointment as Director, he began to launch them one by one, and the program now can be summarized as follows:

1. Operation of the regular activities of the Bureau on a budget of $5,200,000 for the fiscal year, 1934, and $5,205,250 for 1935, as compared with about $8,500,000 in previous years. This has been accomplished by careful trimming and pruning in every division and section through elimination of waste and duplication. No essential function has been abandoned, and the services to airmen and the public are virtually the same as have been rendered in the past.

2. Improvement of the Federal Airways System by the construction of more than 3,000 miles of new lighted and radio-equipped airways, and by modernization of existing facilities. This is being accomplished with special allotments from the Public Works Administration.

3. Initiation of work on more than 1,000 airports throughout the country in cooperation with the Civil Works Administration, an agency since disbanded. About 60 percent of the projects are new fields, the remainder improvements of established ones. After CWA was dissolved, assistance of the Federal Emergency Relief Administration was enlisted to complete work on airports where construction had been started.

4. The low-priced airplane project. Realizing that a natural healthy growth in private flying cannot be expected until there is an airplane which many persons can afford to own and operate, Mr. Vidal has initiated a program seek-

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TRI-STATE COLLEGE

ing the introduction of a safe, small, easily-operated, low-priced airplane. The airplane can be made available, he contends, by volume production. A survey of the potential market, revealing that there were at least 60,000 prospective purchasers for such a craft, intensified this conviction. Legislation passed last session of Congress empowered the Bureau of Air Commerce to undertake development work on new types of airplanes, engines and accessories. From a special appropriation of $1,000,000 which is to be used at the discretion of the President in further development of military and civilian aviation, the sum of $100,000 has been made available to the Bureau of Air Commerce. Under this authority and with these funds, a Development Section has been organized in the Bureau, and the first task of this new section is to investigate possible designs for a safer low-priced airplane for private use.

5. Revision of the regulations governing the activities of noncommercial pilots. For several months private flyers have had the advantage of these amended regulations, making it simpler for them to obtain licenses and meet their obligations to the department in connection with retaining them without in any way impairing the safety of flying.

6. Revision of the airline regulations. As already pointed out, the new regulations seek further to augment safety in scheduled service by defining the operations which may be attempted by single-engined craft, and those which shall be carried out by multi-engined craft, and by setting up individual safety standards in connection with flying equipment, personnel, weather-reporting service, and air navigation aids for each division of each route flown by interstate passenger airlines.

Following himself the suggestion that the Bureau has made to other experienced pilots, that they maintain commercial grades of pilot licenses only if they are flying for hire, Mr. Vidal is carried on the records as a private pilot. His flying time now stands at 2,200 hours, and he gains additional hours whenever he goes out to the field by acting as his own pilot. Mrs. Vidal also knows what to do with the controls, and formerly held a student permit. Nine-year-old Eugene, Jr., after one of his frequent flights with Eugene, Sr., said, "Oh, my Dad is a sissy. He wouldn't do any stunts at all."

EDITOR'S NOTE. It is through this intimate and authentic biography that our readers learn the real nature of the real Eugene Vidal who holds the most powerful and influential public office in aviation.

Much has been written about Vidal, both for and against, in other magazines but it has remained for POPULAR AVIATION *to get the story from his daily associates in the Bureau of Air Commerce. While many of Vidal's acts may be questioned, yet* POPULAR AVIATION *believes him to be a capable executive, thoroughly honest and sincere but in a difficult position where criticism always reigns.*

Sound-proofing

(Continued from page 374)

ing the cabin that is hindering the transmission of sound, but also the need for absorbing such sound as did penetrate in spite of sound-proofing.

If the interior finish is suitable for reflecting the entering sound, it is not suitable for absorbing the sound which has already penetrated inside the cabin. In architecture, certain materials have been found useful for sound absorption purposes, such as hair felt, plaster, cork board, various fibers, draperies, etc., and a number of patented preparations have been put on the market.

Tests of such materials have established the following general principles. They are based upon extended tests and experience and are basic facts to be observed in silencing an airplane of the transport type.

1. Absorbing materials should be porous, compressible and elastic.

2. Painting or varnishing interior surfaces tends to reduce their sound absorbing properties.

3. Absorption increases with the thickness of the materials employed.

4. When the material is perforated and the perforations are exposed, the absorption increases.

5. Covering an absorbing material with a perforated metal does not change the absorption very much.

6. Curtains hung straight are not nearly as effective as curtains that are draped.

7. Draperies act better if hung away from the walls.

8. Draperies and balsam wool, suitably backed with paper, are particularly effective considering their light weight per sq. ft.

9. The absorption coefficients of most materials increase at higher frequencies.

The following are the absorption coefficients of some typical materials, at a frequency of 512 cycles per second:

Occupants have an important bearing on the absorption of sound, thus:

Women without coats are equivalent to 2.3 sq. ft. of open window.

Women with coats are equivalent to 4.0 sq. ft. of open window.

Men without coats are equivalent to 4.1 sq. ft. of open window.

Men with coats are equivalent to 4.8 sq. ft. of open window.

This explains why an airplane cabin is quieter when fully occupied.

In general, for interior finish, designers may consider hung draperies; balsam wool or Kapok covered with a light stretched membrane, or a thin sheet of perforated metal or cloth; mohair pile; or cotton velour.

If air-sick passengers are encountered it may be advisable to consider cheap imitation leather for the seats and side walls and linoleum for the floors—these materials can be easily washed and deodorized.

END

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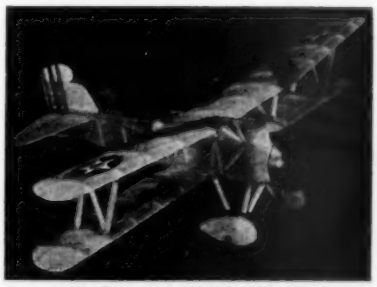

$1.50 Curtiss Hell Diver

MODEL AIRCRAFT ENGINEER
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Gates Circus

(Continued from page 368)

With four planes (1925), the Gates Circus attacked New York City in a mock air raid. They stunted, wing-walked, plane-changed, and dived within 100 feet of the sidewalk. They flew around and through the canyons between the skyscrapers and worked up a tremendous amount of publicity for that time.

Of the old bunch with Gates, three of the members later flew the Atlantic. Brock with Schlee, Stultz with Amelia Earhart, and Pangborn with Herndon. Menefee and Stultz have airports named after them. Pangborn has a street named after him in Hackensack, N. J. There never was a more careless carefree bunch than these men.

The circus broke up in December, 1928, and during its operations—outside of a few stuntmen—none of the flyers or pilots lost their lives until after the circus disbanded. But it was only four months after the circus broke up that the pilots began to be bumped off while flying in more modern aircraft.

Eugene Cecil made a forced landing in a field near Morgantown, W. Va., in April, 1929. He hit a fence and broke his neck. On June 28, 1929, Jack Ashcraft plunged to his death at Roosevelt Field, N. Y., while engaged in an endurance contest. Four days later, Wilmer Stultz spun in with two friends and was killed. McKinney was killed in the 1930 air-race at Teterboro, N. J., and was followed two months later at the same field by Roy Ahearn, who plunged 4,000 feet after attempting an outside loop.

Freddie Lund was killed in an air-race in 1931. Brock died of cancer. Gates committed suicide in 1932. Mason died at Hadley, N. J. Erret Williams died out west. McMahon died in 1933, near Washington, D. C.

These are just a few of the facts that come to my mind at present and within the limited space of a letter. I am not writing a book. In case you want any more information I shall be glad to give it to you at any time.

I remain, sincerely yours,
Bill Rhode,
Renegade Aeroplane and Motor Co.,
West Englewood, N. J.

(Thanks a lot, Bill, I'll take you up at your word.—Ed.)

Members of the Gates Circus

PILOTS

Clyde E. Pangborn
Ivan R. Gates (deceased)
Lowell Yerrex
William C. Brooks
Eddie Brooks
Earl Parker
Raymond A. (Tommy) Thompson
Clevenger
Eddie Bond
William Brock (deceased)
Jack Ashcraft (deceased)
Freddie Lund (deceased)
Wilmer (Wild Bill) Stultz (deceased)
Samuel (Buck) Steel
Harold McMahon (deceased)
Ives McKinney (deceased)
Erret Williams (deceased)
Lee Mason (deceased)
Roy Ahearn (deceased)
Capt. Warren Smith
Joe James
Eugene Cecil (deceased)
Jess Menefee
Vance Breeze
Errol Ball
Okey Bevins
Slim West
Don P. Graffiin

STUNTMEN

Thornton (Jinx) Jenkins (deceased)
Wesley May (deceased)
Milton Girten
Steve Howland
Duke (Diavalo) Krantz
Charles Massa
Jack Conkle
Alfred Masters
Bill Coniry
Paul Vernier
Lloyd Geraldson

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NONE WITHOUT
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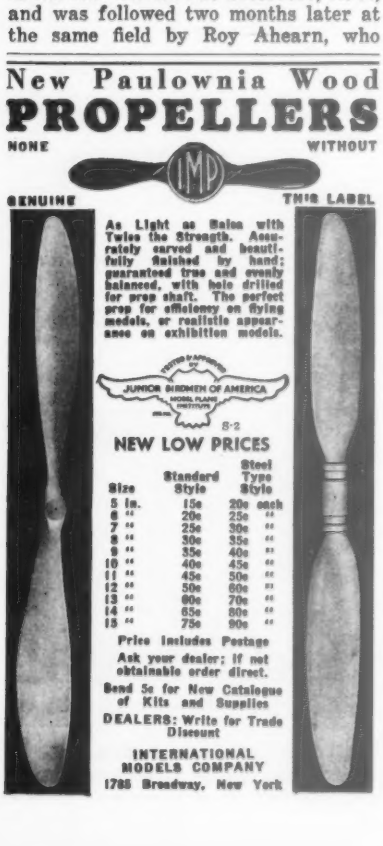

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MODEL AIRCRAFT CORPORATION
7 EAST BROADWAY — NEW YORK CITY

Parachutes

(Continued from page 360)

type which is separate from the harness and is suspended from the cabin wall.

It has but to be taken from the wall and its one fitting inserted into a female fitting on the harness and given a quarter turn. It is then ready for use. Then there is the most popular type, known as the Army S-1, or the "seat-pack," which is used by pilots and passengers who have no occasion to move about while in flight. With this type, the pack provides a suitable and comfortable cushion on which the wearer sits until he is ready to use it.

Each of these models, when tested to destruction, have shown a remarkable ability to withstand punishment. The overall strength factors are much greater than will ever be required in actual service. Parachutes with 600 pounds of lead weight, opening at speeds of 100 m.p.h. have shown no signs of strain and with only a slightly increased rate of descent. Likewise, diving speeds of 400 m.p.h. with 200-pound lead weights, where the opening shock sounds like a cannon report, leave no detectable strain of materials.

In normal drops, an opening parachute, by virtue of its length when stretched out, covers a vertical distance of from 50 to 95 feet depending upon the speed of the aircraft before complete deployment. Even in still air, at terminal velocity, opening will take place after a fall of only 123 feet.

Lap and chest-packs are in demand by photographers and machine-gunners or in service where the wearers are restricted in their movements. A recent innovation, the chair 'chute, is meeting with popular approval as it is an integral part of the chair itself until ready for use. The wearer, with harness on, has but to stand up and leap from the ship. Another type, meeting approval with cabin-planes, is the detachable-pack type which is being seriously considered by several commercial operators. One of the problems to be met in passenger plane work is the necessity of concealing the chute.

Average opening speeds are one and three-fifths seconds which have explained the several live jumps safely negotiated from the extremely low altitude of 150 feet. These facts cannot but reflect undying credit upon the perfection of design, workmanship and material from which the finished product, the modern parachute, has been evolved.

END

NOT HOUSE-BROKEN!

We call him Scotty. When your guests put cigarettes in the ash tray—and pat Scotty's head, he'll raise his little hind leg and—PUT OUT THE CIGARETTE. Convenient water sack inside Scotty is easily filled. At last a canine's most inconvenient habit has been turned into a practical and extremely funny use! Scotty mounted on ash tray—both in attractive bronze finish.

Scotty may be had for $1.50 postpaid. Money back if not completely satisfied. Remit to

HOME GADGETS
Dept. 198, 200 5th Ave., New York City

ONLY $1.50 each, delivered

Corben Engine

(Continued from page 377)

less than $200 for the complete new motor already built up. The necessary parts and castings, machined ready to fit on your motor, will be within the reach of every sportplane builder. The total weight of the engine and propeller hub is only 217 lbs. dry.

And there is one more important thing that we must consider in making comparisons between Ford engines and standard lightplane aero engines. That is, the matter of repair parts and replacements. Replacements for a Ford engine cost only a small fraction of the cost of aero engine parts and they can be obtained promptly, even in a very small town.

The high cost of aero engine replacements is an important item in the cost of upkeep and flying, and the Ford engine solves this problem to the satisfaction of all owners. Then, again, the owner does not have to wait a week or so for delivery of the parts from the factory.

Considered purely from an operating standpoint, the converted Ford engine shows another distinct advantage. Common, everyday automobile gasoline can be used with the Ford engines, generally less than 20 cents per gallon, while the highly expensive aviation gasoline is employed with the aristocratic aviation engines.

Five gallons of automobile gasoline cost about 70 cents at the present time while five gallons of high-grade aviation gas will cost approximately $1.20. This is a distinct saving that should be apparent, for it is a saving that continues throughout the entire life of the engine. And further, the automobile gasoline can be obtained at any time in any locality.

Then, the Ford engine is a rugged structure that is not so easily damaged as the light, frail aero engine. As everyone knows from experience with Ford cars, the engine can withstand a surprising amount of abuse. In spite of the fact that this engine comes from the cheapest car on the market, it is built of the finest materials obtainable and all of the parts are of generous proportions. Even with the older and imperfect conversions, the engines stood up nobly against amateur flying conditions.

By the time that this article appears, we will have flight tested this engine in one of our little ships which we are now building. It will be a single-place sport job of unusual streamline appearance and design. No doubt POPULAR AVIATION will give you all the dope on the flight tests of this new little ship which will be known as the CORBEN SUPER ACE and will be powered with the above Ford conversion. Complete details and plans for both the ship and the motor will also appear in an early issue of POPULAR AVIATION.

END

BARTER and EXCHANGE

Notices in these columns are exclusively for trades. Cash sale advertising must be inserted in the Directory or under classified advertising. Notices in the Barter and Exchange column, five cents per word.

AIRPLANES

FOR SALE—Licenseable International 3-place open, biplane, 150 h.p. In good condition. No crack-up. Inside storage the year around. Can be flown away. Will consider $175 cash or $125 and approved parachute or speedboat.—Otto Tomes, 5101 S. Keating Ave., Chicago, Ill.

WANTED—2-place Aeronca, American Eaglet or Rearwin Jr. Must be licensed and reasonable for cash or car. State all in first letter.—K. L. Walker, 143 W. Grand St., Rahway, N. J.

WANTED—Curtiss Junior or similar two-place ship in good condition. Must be located within 600 miles of Rapid City, S. Dak. Write—W. Wolverton, Custer, S. Dakota.

AIR-CAMPER—Practically completed, with Chev. conversion, new metal-tipped Flotrop prop., all instruments, duel controls, split type landing-gear, a new covering and paint job. Just the ship for one or two fellows. Must sacrifice.—Harold Oldenburg, 915½ Wisconsin Ave., Sheboygan, Wis.

TRADE AirKing OX-5, licensed until September, 1935, for licensed light ship or $275.—Homer Agar, Langdon, N. Dak.

WANTED—A glider of any proven design. State full details in first letter. Enclose photograph if possible.—Laurence Phillips, Chelsea, Okla.

SAILPLANE GLIDER—55-foot, strut braced, tapered wing. Wing rebuilt with 45-degree mahogany plywood box beams. Large controls. Complete except wing covering. Trade for car, motorboat, motorcycle, radio, or what have you. —Corky Haynie, 859 So. Wooster, Los Angeles, Calif

WANTED—American Eaglet or Aeromarine Klemm less motor, any condition. Will pay cash. Will trade or sell Ace single-seater less motor, good condition, never cracked. What am I offered?—Wilbur Parrish, 825 W. Division, Decatur, Ill.

PARKS P-1, just recovered and refinished, licensed, overhauled, and with compass, airspeed, and brakes. Will trade or give terms, what have you?—Box 16, Station L, Cincinnati, Ohio.

HAVE WACO 9 in good flying condition. Indentified, A-1 motor. Will trade for a late model car or cash. Also have good OX-5 motor, American Eagle parts.—J. C. Read, Leeds, N. Dak.

CRACK-UPS WANTED. Rebuilt and repaired, experienced A. & E. Will exchange services for auto, cash, or what have you.—Carl Doyle, North Baltimore, Ohio.

NEW Heath V Parasol, 19 hrs., new prop. Flyaway Lyndhurst Airport, Mayfield at Ford Rds. $200 or ?—H. A. Tice, 13521 Rugby Road, Cleveland, Ohio.

FOR SALE—Waco F 125 Kinner, excellent condition, painted July, 1934, white, scalloped black nose and tail; starter, metal prop.; never cracked, $1,800. Also four cylinder pistons, set wiring, and crank-case for American Cirrus 90 engine.—J. C. Cox, Charlotte, N. C.

LIBERTY BOEING, suitable advertising, $550 or trade. Eaglerock, American Eagle wings. Klemm parts. Aerial camera. 4-cylinder motorcycle engine. Trumpet. OX Challenger. 1930 Stutz sedan. Want air-cooled job.—Miller, 10 Willard, Montclair, N. J.

WANTED—Lightplane less engine, crack-up, semi-finished parts, engine or parachute. Have much to trade, something of interest to all.—Raymond Egan, Lincoln, N. J.

WANTED—Heath or Aeronca fuselage only. Less wings and motor. What can you use?—O. E. Greenland, 5423 Calumet, Hammond, Ind.

FOR SALE OR TRADE—Identified Velie Monoprep for a late Chev. or Ford. Covering on the ship like new. Winter enclosure with ship. —Box 205, Dale, Wisconsin.

CONVERTED HENDERSON, less prop. Parts for Indian twins, magnetos, generators, etc. Want deep crank-case Heath-Henderson, or trade separately.—Robt. Gurley, New Hartford, N. Y.

FOR SALE OR TRADE—Cessna primary glider and shock cord. Good condition.—Edward Lambert, 821 E. Willard St., Philadelphia, Pa.

WANT LIGHTPLANE or OX powered job. Plane needn't be in best flying condition if a a bargain. Have good 1930 Harley Davidson. Write—Luther Moore, Rt. 1, Dyersburg, Tenn.

MISCELLANEOUS

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WHAT am I offered for Borntraeger's plans for front-drive auto?—Francis McKinnon, 200 North Perry St., Hagerstown, Indiana.

WILL SWAP complete Atlas course, cost $35, for a .22 rifle in good shape, bolt action preferred.—J. Schmidt, 2049 N. Orianna St., Philadelphia, Pa.

WANTED—Printing press in good condition, hand or power. Must print 5x8 or more and be complete with plenty of type. Have over $15 worth of hits and supplies, also jig saw.—John Kubica, 1243 S. 58th Ave., Cicero, Ill.

AGE 22, ex-service man, can handle tools, intelligent, ambitious, tall and strong, willing to work, any labor, anywhere, in return for pilot's license or mechanic's course, and board and lodging.—Alex Schwartz, 3433 Gates Place, New York, N. Y.

FOR SALE OR TRADE—One pound fine mixed, stamps! 50c.—Rettig, 105 East 102nd St., New York.

WILL EXCHANGE work for flying time with barnstormer, beginning June 1, 1935.—Orville Bolstad, Northwood, N. D.

MISCELLANEOUS PARTS

TRADE OR SELL propellers, all types. Twin engine, $6 or good swap.—Watson, 1412 Cleveland, Jacksonville, Fla.

SET OF GLIDER WIRES, landing, flying, and control. Trade for aviation books.—Box 30, Schertz, Texas.

HEATH WINGS, uncovered, Model V, never used, good workmanship, best material, cadmium plated fittings, gas tank in each panel. Aileron and tip of left wing, not assembled. Will take firearms, cash, or what have you.—Joseph Gluns, 3657 Greenview Ave., Chicago, Ill.

WANTED—Compass, air-speed, turn-and-bank, rate-of-climb indicators; J 5 cowl; ring wheels with brakes for 2 3/16 hub. Have good motor cowling and radiator for Travel Air OX.—Herbert Westphal, 1817 Jarvis St., Milwaukee, Wis.

ALCO CABIN FUSELAGE (wood), two spars, blueprints. Want small auto radio or pontoon blueprints and 3 pairs goggles.—Lavender Bros., Box 658, Oak Hill, W. Va.

WANTED—A Church right wing.—L. Sullivan, 319 S. Waco St., Hillsboro, Tex.

FOR SALE OR TRADE—Curtiss Robin, fuselage instruments, tail surfaces, struts, controls, good OX-5 motor, cowling, seats, safety belts.—Howard Sevdy, Worthington, Minn.

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IF YOU are looking for a certain aviation book, you can frequently locate the book by advertising in the Barter and Exchange columns. In very many cases, our readers have made very advantageous swaps, trading in something that they did not care for, thus getting the book they desired.

In the same way, you can arrange swaps for airplane photos, magazines, etc. The Barter and Exchange serves a real purpose and many readers have thanked us for this opportunity.

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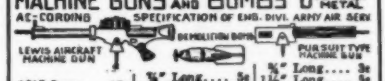
ACCORDING SPECIFICATION OF ENG. DIVI. ARMY AIR SERV



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1¼"	Dia.	10c	2"	Dia.	10c
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4"	Dia.	25c	3"	Dia.	20c
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READY TO RUN
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Tank holds 100 lbs. air. Motor turns 16" prop. Flies 6-ft. model.
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BALSA STRIPS 18"

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1/16x1/16, 80, 5c	1/8 x1/8, 30, 5c	1/4x3/8, 6....5c
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7/8x1	1/8x10,	2, 6c	1/16x2,	8, 10c	1/4x2,	3, 10c
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IMPERIAL LEADS AGAIN
FREE OFFER SEE PAGE 392
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With wind-movement...$3.95
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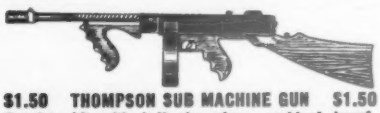

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Complete kit with half size plans, machined barrel, magazine and necessary hardware.
Postpaid. No Stamps. Please
GUN MODEL CO., 2908 N. Nordica Ave., Chicago, Ill.
Kits for All Model Guns, 50c up

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All of these propellers are cloth tipped. Send cash with order for prompt service.
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Fine quality, absolutely guaranteed watch. Beautiful chrome finish case with unbreakable crystal. A neat wrist-fitting model with choice of genuine leather or metal link band. Send only $1.00 and pay postman $2.45 plus few cents postage on delivery.
P. A. R. COMPANY
Dept. 306-A Galveston, Texas

Military Science
(Continued from page 356)

"mixture controls" to assure proper running of motors.

Very pistols, flares, landing lights, and navigation lights for night flying, electrical starters for the motors, gasoline gauges, brakes, and valves for extra gasoline tanks were all added for obvious reasons.

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Can actually be carried in your pocket or purse! No tubes, batteries—nothing to wear out. Simply clip to anything made of metal for clear beautifully toned reception. Only one control—gets all stations within 50 to 100 miles distant! No aerial needed! Complete with tiny phone—absolutely nothing else to buy. Send only $1.00 and pay postman $1.95 plus postage, or send $2.99 (M. O., currency, check) and we will send Postpaid. Complete Ins. included. Guaranteed. Send your order now! **Tinytone Radio Co., Dept. P.A Kearney, Nebr.**

CLASSIFIED

USED AIRPLANES, gliders, $30.00 up. Literature, 10c. Continental, Box 344B, Indianapolis, Ind

HEATH LNA-40 Parasol, licensed June, 1935, just recovered, complete, instruments—compass G. E., tachometer, oil temperature, oil pressure, gas gauges, wheel pants, factory new guarantee. $575.00 cash. Terms to responsible parties. International Aircraft, Niles, Michigan.

Military planes carry besides the instruments listed above, bomb-racks, bomb-releases, bomb-sights, pilot-directors, interphone systems, and machine-gun equipment. The military pilot is a busy man when he flies on tactical missions. He takes many side glances at his instruments, makes necessary adjustments by "feel," keeps himself supplied with oxygen when needful, works hands and feet on the controls, and concentrates on his main job of flying close formation with his leader.

Each and every instrument and mechanical adjunct to a military plane must be kept in perfect order continually. The average layman cannot easily comprehend how rigid a necessity this is. Not only is absolute efficiency in all these appurtenances required to enable a combatant pilot to meet and dispose of an enemy successfully, but even in times of peace, flying in aerial drill or in various journeys, the plane itself and all of its component parts must be thoroughly dependable. Eternal vigilance is the price of safety, and no pains are spared at March Field to hold fast to this maxim.

In connection with this overseeing and preparing a plane for actual war service, or for peace-time maneuvers, skill, experience, and watchful care are demanded of all men in the service who look after the planes. The pilots, of course, are meticulously watchful and quick to notice any possible oversight however slight. But the men handling the parachutes, and the many other aids and adjuncts to the planes must be experts in their line, and workmen of proven dependability.

Thus, it is conclusively shown that future warplane efficiency has been impressively advanced by the work being done at March Field. It not only has added vastly to the value of this service, but it also makes for a greater measure of safety for the pilots. Needless to say that their calling demands an utter disregard of personal safety, and an icy courage at all times, but their value to their country is eminently dependable on their safe going and returning, and every hazard eliminated is a point gained.

It is contended that Southern California's Military Flying Base has gone ahead more scientifically and thoroughly into this angle of the military flying service, than any of the other government stations. There has been a steady and a most gratifying advance in connection with the work, which has been carried on with the highest degree of efficiency and enthusiasm. It can conservatively be claimed that the First Bombardment Wing, March Field, leads the country in the development and use of radio communication for military planes. Major Carl Spatz, Wing Commander for a number of years at the Field, worked incessantly on the idea of better communication in the air, with the result that his ideas bid fair to revolutionize air tactics.

That future warfare, especially on a large scale, is certain to be dominated to a considerable extent by the employment of aerial forces, is the settled opinion of a number of military men of long experience. The future of warplanes, maneuvered on extensive lines, holds possibilities which as yet have not been perhaps sufficiently realized.

Neither coastline cities nor inland metropolises are secure against fleets of military planes, and the lesson of the World War is that a false sense of security, founded on ignorance, is "mortals' chief enemy." Here on the Pacific Coast, no possible combination of naval efficiency could prevent bombing planes from safely eluding such a defense, and swooping down on both coast and inland cities, unless there were an air force here to meet and battle with such invaders.

Such a military base as March Field is in the final analysis a vital bulwark for the safety of California from dangers through air invasion in case of war.

END

ICE-BOATS
Portable, Fast, Sturdy, Low-priced. Winter's Greatest Thrills are yours with a MEAD ICE-YACHT. SAVE MONEY by building yours with our Complete Kit easily, quickly, and with sure success. Start NOW and have your ship ready for the season's first ice. Pay as you build. Rush dime for illustrated circular, prices and complete list of materials, fittings, sprees, etc. MEAD GLIDERS, 12 South Market St., Dept. 12-E, Chicago.

Airline Methods

(Continued from page 350)

"time table" advertisements, in which schedules and rates are given. Such advertising is frequently inserted and also includes a snap line regarding the excellence of service or the record of operation behind the line.

The second type is found mostly in magazines in the form of feature articles and educational advertisements. Facts concerning equipment, lighting of airways and operation over them, radio safety and navigational devices and, once more, educational photographs are broadcasted. All of them tend to get the public to gradually accept air transportation as a safe and common mode of travel.

Feature articles by well known writers talk about extended trips by air, covering all the experiences of an air traveler, they are invaluable. They are gobbled up by the readers. Educational once more. Window displays. The public must be reached in every possible way in order to erase from their minds the many harmful myths concerning air transportation which are so prevalent. The days of aviation from 1918 to 1926 or 1927, when antiquated planes, unsure pilots and haphazard methods resulted in screaming headlines of horrible death, left a deep and indelible impression on people's minds. The progress since then is not generally known, or, if known, not generally accepted.

The job of wiping out a blood-spattered past is a terrific one, but the airlines are valiantly attacking it and are slowly but surely winning the battle. The airlines probably spend a greater proportion of their income for advertising and general educational work than any other industry, and it is gradually bringing them profit.

In the past few years, the conventional methods of advertising have been supplemented by motion pictures showing a trip by air from the passenger's viewpoint. These pictures are shown by the Traffic Department's men wherever and whenever possible. The investment has been a profitable one. Such, in brief outline, is part of the great work of keeping an airline in the air.

And the desks of newspaper and magazine editors are showered continuously with interesting items concerned with air-travel, in the hope that their publication will react favorably upon the advertiser. This is the best of publicity.

An airline is very much like a living being. It has its various organs and parts, the health and sturdiness of each, working in coordination with the others, determining the general health and efficiency of the whole body. The Traffic and Publicity Departments, working in close laison with each other, form the very beating heart of an airline, constantly pumping a life-giving supply of money into the other organs.

END

Glenn Curtiss

(Continued from page 352)

1925 Development of the *Lark*, a four-place passenger and cargo plane.

1926 to *1927* Development of the 650 and 675 h.p. *Conqueror* engines.

1928 The *Fledgling* training plane developed for the Army and Navy. Production of the *Robin*, a three-place cabin high-wing monoplane powered with a Curtiss OX-5 motor.

1929 Production and marketing of the 20-passenger *Condor* transport and the 8-passenger *Kingbird* commercial plane.

In addition to these planes, Curtiss continued to build racing planes for the Pulitzer and Schneider races and in 1924 Lieut. Maughan, flying a Curtiss pursuit ship, made the first "Dawn to Dusk" flight across the United States.

It is said that Curtiss originated and built at least one example of every present-day type of plane. And this is nearly true.

Glenn H. Curtiss was a successful designer and manufacturer. Realizing how dangerous failure can be, he built slowly. Using the experience which he gained from day to day, and having patience and perseverance, he made his ideas work for him. When he died, on July 23, 1930, aviation lost one of its greatest personages.

END

Start Training at LINCOLN Now

for the BIG PAY JOBS IN AVIATION

Government Expenditure Means Thousands of New Jobs for Pilots and Mechanics Properly Trained

as LINCOLN Trains You!

The U.S. Government recently appropriated 10 million dollars to build new airports; millions more are planned to help build and market 25,000 airplanes and to make America first in the air. Naturally this means thousands of new aviation jobs for pilots and mechanics properly trained . . . as LINCOLN trains you. Yes, aviation offers rich rewards for men who start training now. Here at LINCOLN you are given the most thorough training by seasoned Government-licensed instructors that equips you for the better, big-pay jobs.

Learn to fly all types of modern planes—high- and low-wing monoplanes, biplanes, open cockpit and cabin transport ships. Primary and advanced flying taught; includes straight flying, blind flying by instrument, cross country, spot landing, aerial navigation, aerodynamics, acrobatics, meteorology. Master mechanic's airplane and engine course prepares you for mechanic's position.

Airline pilots earn up to $500 a month. Airplane and engine mechanics also earn good pay. Let LINCOLN train you for a successful career.

The Lincoln Flight and Mechanic's Schools pictured here are ranked with the finest in America.

Government Approved School

Lincoln is internationally known and famous for turning out the better-trained pilots and mechanics for the better aviation jobs. From Scotland, South Africa, Canada, Alaska, China, and from nearly every state in this country have come students to Lincoln to get training that assures success.

Be Ready for the Opportunities

You can be one of tomorrow's big-pay pilots or mechanics. Lincoln's seasoned, Government-licensed instructors know how to train you for success and are ready to do so now. Lincoln's excellent, modern-to-the-minute equipment is at your service. Rich opportunities are ahead in South and Central America as well as in the United States.

Part-time Employment. For a limited time, Lincoln can offer part-time employment to help ambitious men earn their living expenses while in training at this "World's Best Known School." Better hurry! Mail coupon now!

Mail Coupon

24 years' success as mechanic's trade school and 14 years teaching aviation stand behind your training at Lincoln. Mail coupon now for complete information.

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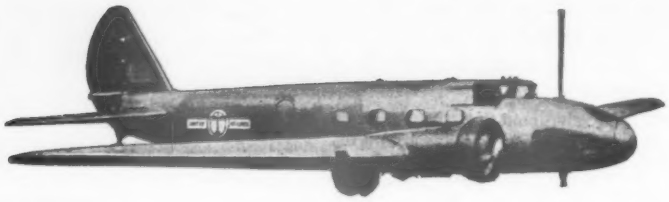

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This book covers the same ground as the course given the enlisted mechanics of the Army Air Corps with the addition of much data on types of equipment adapted only for commercial airplanes. It deals thoroughly with all kinds of aircraft engines and their accessories. It explains exactly how they operate and the features in which the various makes of competing equipment resemble each other and those in which they differ.

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ESSENTIAL FOR SAFE FLIGHT:

Airplane Mechanics Rigging Handbook

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